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A QUARTERLY JOURNAL DEVOTED EXCLUSIVELY TO PROBLEMS OF THE

DEAF AND DEFECTIVE SPEECH

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ORIGINAL COMMUNICATIONS.

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INDICATIONS FOR SURGICAL INTERVENTION IN ACUTE SUPPURATION OF THE MIDDLE EAR.*

DR. PHILIP D. KERRISON, New York City.

I should like to say that in venturing to present this rather hackneyed subject before this body, I have done so at the request of the council of the society. In other words, the subject is very distinctly not of my selection. It is particularly difficult to formulate any absolutely safe rules as to the indications for operating in acute middle ear and mastoid lesions, and if my statements are made with rather more dogmatism than I usually care to employ, I have used this form as perhaps providing a better basis for your more important discussion which is to follow.

I take it that "surgical intervention" in the sense of this discussion should include the operations of *myringotomy and mastoidectomy* and no others.

Indications for myringotomy. Whenever in a case of acute aural disease, the symptoms and physical signs give clear indications of tympanic infection with evidences of fluid pus in the middle ear, the drum membrane should be incised. If we must state this in the form of a syndrome, reduced to its most elementary components, I should say that *earache, elevation of temperature and some impairment of hearing coupled with physical signs of an inflamed and bulging drum membrane* call for prompt incision of

*Read in Atlantic City before the American Otological Society on May 14, 1923.

*Accepted for publication in "The Laryngoscope", May 31, 1923.

the drumhead. I shall discuss this indication further in the latter part of the paper.

Indications for mastoidectomy. In the presence of the classical symptoms of mastoid infection—which need not be outlined before the members of this society—the following conditions would call more or less positively for surgical intervention,—i. e., the classical mastoid operation:

1. Post auricular oedema or subperiosteal abscess.

2. Definite mastoid tenderness, extending well beyond the limits of the antrum, and showing no tendency to diminution within 6 or 7 days following incision of the drum membrane.

3. Marked variations in the amount of discharge extending over a considerable period of time, the periods of maximum flow showing an amount of pus obviously too great to be of purely tympanic origin. Should this condition be accompanied by temperature variations, the higher temperature levels coinciding with the periods of diminished discharge, the indication for surgical relief would be further defined and emphasized.

4. Prolonged discharge from the ear, if associated with persistent and marked diminution of hearing, constitutes a valid reason for operating upon the mastoid. This statement is based on the need of surgical drainage as a means of safeguarding the hearing and in the large percentage of such cases which eventually call for surgical intervention as the surest, and in some cases, the only way of bringing about recovery.

5. In the fifth position, I would place, if I may coin a term, what may be spoken of as the *dripping drum membrane.* I refer to the condition in which an inflamed and infiltrated drum membrane, after one or possibly repeated myringotomies, continues constantly to exude pus. We may cleanse the canal by any means at our command and then, as often as we wipe away pus from the region of the perforation, it is seen to drip almost drop by drop into the canal. It is a slow welling up of pus indicating an overflow from surcharged mastoid cells, and usually indicates the need of drainage through a mastoid operation.

6. *Temperature.* I have said little of temperature changes for the reason that fever is so inconspicuous a symptom in many cases even of severe mastoid inflammation. During the course of any case of acute or subacute tympano-mastoid infection, however, a sudden change in the temperature range—either in the form of a rapid elevation to high temperature or of a slowly mounting temperature curve—may constitute a valid reason for surgical inter-

vention. It is understood, of course, that this indication would have weight only after careful elimination of other causes in intercurrent disease not of otitic origin.

7. Evidences of tympano-mastoid infection being present, the development at any time of homolateral abducens paralysis —i. e., as shown by diplopia and paralysis of the homolateral external rectus occuli—constitutes in my opinion a very positive indication for the mastoid operation. This statement is based on the statistics in such cases which show fairly conclusively a percentage of mortality which is very decidedly larger in cases not operated upon than in those operated upon. Recovery of occular function is also more rapid and occurs in a larger percentage of cases following a careful mastoidectomy than in cases treated non-surgically.

8. Finally symptoms of mastoiditis having been or being present, the development of symptoms of septic absorption—e. g., chills, sweats, septic temperature curve, etc.—would indicate the urgent need of immediate surgical intervention.

I have intentionally omitted in the above any mention of symptoms referrable to the static labyrinth—i. e., of vestibular irritation—because I believe that each such cases should be made the subject of careful individual study before deciding upon any surgical measure. To discuss this question conservatively and without unwarrantable dogmatism would unduly prolong this paper.

In trying to formulate any rational statement of the indications for mastoid surgery, one is prepared to admit that under all or any of the conditions above outlined the patient, if he refuses operation, may yet recover completely. The aurist, however, is called upon to consider the following questions: (a) whether the patient's condition is such that prompt relief through post-auricular drainage is called for; (b) whether the physical changes in tympanic structures with evidences of pronounced functional loss call for surgical intervention for the conservation of hearing; and (c) whether the possibilities of intracranial invasion outweigh in any particular case the advantage of delay.

It seems to me that to formulate any binding or blanket rules as to time limits—e. g., that mastoid tenderness persisting for two, three or four days calls per se for mastoid surgery—is to ignore much or all that is known of the variations in type of mastoid structure.

With a mastoid of pneumatic type and thin cortex, marked tenderness on pressure may coexist for days with other symptoms of quite favorable prognostic significance—e. g., improvement in hearing and in tympanic physical signs, progressive diminution of discharge with continuously normal temperature, etc.

However careful one may be in formulating rules for operating upon the mastoid, there is yet another factor—not easily reducible to words—which nevertheless may modify the judgment of an experienced surgeon in regard to a particular case, and overrule the deductions usually to be drawn from certain signs or symptoms present. I refer to that indefinable something in the patient's general appearance or condition which in spite of fever or mastoid tenderness may indicate, or at least suggest, that the progress of the lesion is advancing favorably in one case and unfavorably in another. This is particularly true in the case of infants and young children. It is an intuitive inference based on the subconscious memory of many cases carefully observed. It councils delay in operating in certain cases which eventually recover wholly without operation. It proves untrustworthy in certain cases in which the need of surgical intervention subsequently becomes obvious; on the other hand, it saves many patients from the trials of a needless operation.

The Blood Count may be passed over with brief mention. Naturally increased leucocyte count and increased polymorphonuclear percentage may be expected as in any suppurative process. Usually, however, the blood changes are not sufficiently marked in uncomplicated tympanic or mastoid infection, and their regular exaggeration with any local exacerbations cannot be sufficiently relied upon, to justify us in placing great emphasis on their invariable presence or importance.

Naturally, in a case presenting unmistakable symptoms of mastoid infection, a steadily increasing leucocyte count and polymorphonuclear percentage would have great surgical significance. On the other hand, in the presence of certain clearly defined local indications, the absence of marked changes in the blood cell count would not carry great weight in disproving the necessity for surgical intervention.

Bacteriology. I have said nothing so far of bacterial findings because it has seemed to me that too much may easily be made of this factor in determining the question of surgical intervention. I have, however, collected 120 cases, taken at random, of mastoiditis operated upon in the Manhattan Eye and Ear Hospital since

January first of this year. The bacteria isolated from pus, taken from the mastoid cells during operation, give the following results:

Non-haemolytic streptococcus mitis	55
Haemolytic streptococcus pyogenes	49
Haemolytic streptococcus infrequens	4
Haemolytic streptococcus anginosis	3
Streptococcus mitis and staphylococcus albus	2
Streptococcus mitis and streptococcus pyogenes	1
Streptococcus pyogenes and staphylococcus albus	1
Streptococucs pyogenes and staphylococcus aureus	1
Non-haemolytic streptococcus salivarius	1
Streptococcus infrequens and staphylococcus albus	1
Pnuemococcus, type I	1
Pnuemococcus, type III, streptococcus mucosus capsolatus	1
	120

Analyzing the above, we find that the streptococcus mitis in pure culture was the offending organism in 46 per cent of these cases, and haemolytic streptococcus pyogenes in 40 per cent. If we add to these the cases in which these germs took part in a mixed infection, we find that they—the non-haemolytic streptococcus mitis and the haemolytic streptococcus pyogenes, were present in 109 cases of this series of 120.

X-ray examination and the question of surgical intervention. This subject has been so often discussed by men more competent than I that my inclination would be to evade altogether this particular issue. Since the function of this paper, however, is to promote discussion, and since the expression of a definite view-point is the best means of accomplishing this purpose, I shall state my belief that the value of mastoid radiograms in determining the need of surgical intervention has been considerably overrated.

In the first place, the possibility of anatomical or structural differences between the two mastoids is in practice usually lost sight of. Of this possible source of error I offer the following instance: In November last, a man came to the Manhattan Eye and Ear Clinic presenting typical symptoms of acute suppurative otitis media of the right ear, but with no tenderness or symptoms of mastoid involvement. I referred this patient to Dr. Byrd with a suggestion that it might be interesting to have an X-ray picture made. A few days later I was shown the report that the radiogram in this case indicated a mastoid filled with pus or granulations with bone ab-

sorbtion to the point of complete destruction of all intercellular structure. On the strength of this report, the patient was urged, considerably against his will and in spite of improvement in the tympanic physical signs, to submit to a mastoid operation. Two days later, being in the hospital while this man was on the operating table, I was sent for by Dr. Byrd, to come to the operating room. I found a half finished excavation through as uniformly hard and sclerotic a bone as I have ever seen even among collections of temporal bone specimens. Not even a tip cell was disclosed. This man made a quick recovery from an operation based solely on a quite natural misinterpretation of asymetry between the two temporal bones.

A few days ago, I was examining with Dr. Law the radiogram of a mastoid, on which a report of "cells containing pus or granulations" had been made. Dr. Law remarked to me that he had repeatedly seen equal changes in the mastoid cells in radiograms of patients suffering solely from furunculosis of the external auditory meatus. I asked if I was to interpret this statement as referring solely to cases of furunculosis giving rise to post-auricular oedema, to which he replied that it occurred as often in cases strictly localized within the meatus. Dr. Law said that he had several times stated these facts in discussions before medical societies.

Recognizing, then, the possibility of anatomical variations between the two mastoids, and further that slight vascular or inflammatory changes in cell linings may be recorded in the X-ray picture, it is clear that the surgical significance of such evidence may be exaggerated.

Of greater interest than the facts above cited, are the X-ray findings in certain cases in which successive radiograms, taken at considerable intervals apart, have shown first disease, then the unfinished process of repair and finally the complete return to normal. This sequence of events has several times been demonstrated by serial plates in the X-ray laboratory of the Manhattan Eye and Ear Hospital. I have a set of plates beautifully illustrating such changes in one of my own patients who escaped operation.

I personally believe that the potential value of X-ray studies of tympano-mastoid disease has not yet been measured. It is perhaps a Utopian fancy that at some future time the joint studies of radiologists and otologists will have reduced the radiographic findings to a more exact and useful place in the symptomatology of mastoid disease—i. e., that the evidences of successive radiograms may be correlated both with the recognized structural types of bone and

with successive stages of the lesion. Such an extension or development of the art of X-ray interpretation might enable us to know in advance—i. e., without surgical exploration—why in certain cases mastoid tenderness is absent, while in others marked tenderness, persisting over very considerable periods, may co-exist with recognizable and satisfactory evidences of bone repair.

If we project ourselves into an imaginary otological millenium and see there a heavily endowed institution specialized for the intensive study of tympano-mastoid infections, is it not probable that the X-ray will have acquired vastly greater interpretative value, while perhaps losing somewhat of its importance as evidence upon which to pass surgical judgment on the patient?

It is probable that very slight inflammatory or congestive changes in the mastoid cells are recorded in the X-ray picture. If this be so, it is clear that the greatest discrimination is called for in the surgical interpretation of mastoid radiograms.

Before turning this subject over to you for discussion I would like to say a few words more (1) as to our own view-point and (2) as to certain fallacies having perhaps a limited influence upon general medical opinion, with regard to incision of the drum membrane.

That an inflamed and bulging drum membrane is in the vast majority of cases best treated by free incision is an otological truism. There is, however, one clinical picture of acute tympanic inflammation in which I am inclined, though always with some anxiety as to the outcome, to postpone myringotomy. It may be described as follows: sudden pain in the involved ear, showing a tendency to subside quickly; drum membrane intensely red and inflamed in appearance but not bulging—i. e., normal landmarks, with exception of light reflex, still maintained; temperature normal or only slightly elevated; *hearing not appreciably impaired.* With such a condition, rest in bed, brisk catharsis, administration of atropin or belladonna in suitable combination with appropriate adjuvants and pushed to the safety limits of physiological action, will bring about resolution in a very considerable percentage of cases without incision of the drumhead. Naturally, the drum membrane should be reexamined at short intervals until the turning point is past.

A factor which possibly has led to some confusion of thought with the medical profession at large, should perhaps be called to your attention. I refer to the published views of men who have

made no special study of otology. It is a distinctly fortunate thing that so many able physicians and pediatricians are acquiring the habit of careful routine examination of the ears. Some of the papers by physicians outside of our specialty have been excellent in every respect, as for example the short but comprehensive monograph on the indications for myringotomy by Dr. Walter Lester Carr[1]. That there are others which run counter to sound otologic theory is not surprising.

Statements or theories on which a consensus of otologic opinion should have authoritative expression. In a paper read before the otological section of the New York Academy of Medicine in 1920, Dr. L. E. LaFetra, after describing a typical picture of acute otitis media, including a red and bulging drum membrane, said: "Only when the temperature is high, the pain acute and the bulging marked, have I deemed it wise to incise at once."[2] These views were further emphasized before a meeting of the Academy of Medicine, 18 months later when Dr. LaFetra expressed his belief that "many red, swollen and bulging ear drums clear up without incision even when bulging is distinct in all its parts, so bulging is not an absolute indication for paracentesis."[3] Discussing the treatment of otitis media in children before a meeting of the New York Academy of Medicine, Section on Pediatrics, Dr. Sidney V. Haas said that he "was sure that early incision was not only not indicated but was actually harmful. It was better to wait 3, 4 or 5 days than to make the incision within the first 24 hours."[4] These or similar views are still being promulgated.

Before giving an opinion as to the value of these contributions, let us consider for a moment the grounds on which the advocates of delay base their arguments. We find that without exception it is the personal experience of the various writers that we are called upon to accept—i. e., the number of recoveries or cures without myringotomy that have occurred. But are these observations, even though set forth in good faith, to be accepted without reservation? Remember that normality of the drum membrane, signs of tympanic disease, and the return to normality are conditions requiring years of experience to interpret correctly. Remember that the papers in question are written by men who are not in touch with practical otology; that the patients they discharge as cured are likely in case of recurrence to fall under the care of an aurist rather than return to the pediatrist or general practitioner. Does the nonspecialist see in sufficient percentages his end-results to make his reports and deductions trutworthy?

Were these contributions to ignorance surely without influence, or if they involved no risks to the community, they might well be deemed inappropriate to this discussion. But since they are distinctly misleading and therefore harmful, an expression of opinion by this society may serve a useful purpose.

Let us say then that an inflamed, intact and bulging drum membrane should be incised without unnecessary delay. If called upon to defend this position, we may give the arguments against delay in somewhat the following order: (1) Prompt incision of the drum membrane may, and in a majority of cases does, prevent serious mastoid involvement, which in turn might lead to grave intracranial complications and death. (2) Experience has definitely shown that the average period of recovery is shorter following early incision than in cases in which myringotomy is delayed. (3) The healing of the membrane, restoration of normal intra-tympanic conditions and, therefore, the reestablishment of normal function is better assured by an early primary incision than by delayed myringotomy or dependence on spontaneous rupture. (4) Recognizing the varying virulence of different germs, delay in opening the drum membrane would seem to be the expression of a loose, haphazard method of thought which takes no account of the nature of the germ present, and may therefore favor the rapid, and possibly fatal, spread of the most virulent type of infection. (5) Finally, delay in incising an inflamed and bulging drum membrane is in opposition to the oldest of sound surgical laws, which demands that confined pus shall be evacuated.

The question of repeated myringotomies is a recurring subject of dispute in otological societies. On the one hand, we hear statements that if after one or possibly two myringotomies the symptoms are not relieved, prompt recourse to mastoid surgery is indicated; on the other, we have the numerous case reports in which complete recovery without mastoidectomy has occurred only after several incisions of the membrana tympani. The writer personally believes that any dogmatic statement as to limiting the number of repetitions of this very logical little operation serve only to bring otology and otologists into disrepute.

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(1) Carr, W. L.: When shall the membrana tympani be incised; Arch. of Pediat., Feb., 1922.
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UNUSUAL FORMS OF EXTENSION IN PURULENT OTITIS MEDIA WITH SPECIAL REFERENCE TO INVOLVEMENT OF CRANIAL NERVES.

DR. HARRY FRIEDENWALD and DR. M. L. BREITSTEIN, Baltimore.

The observation of two of our cases directed our interest to those unusual lines of extension of pus from the middle ear which do not follow the beaten tracks well recognized by otologists. Not infrequently this pus chooses for its extension by-paths and devious routes which are not so well placarded and the consequent sequellae are correspondingly not so familiarly labelled.

We will not consider the ordinary forms of extension of pus from the middle ear often complicated by paralysis of the cerebral nerves. So we will omit: (a) Mastoiditis—including the Bezold variety; (b) Periostitis of the mastoid; (c) Extradural abscess; (d) Sinus thrombosis; (e) Meningitis; (f) Cerebral abscess; (g) Paralysis of the facial nerve due to a lesion in the Fallopian canal.

Our first case was S. T. B., male, white, aged 79 years. The patient's general health had always been good and in spite of his advanced years he had been actively at work as the purchasing agent of a hospital up until the onset of the present illness.

In 1909 he had pneumonia. Although there was no ear suppuration, the patient thinks the hearing in the left ear became bad following this illness. In the latter part of December, 1921, he had pain in the left ear following a "cold in the head." The pain in the ear subsided but there remained a headache which he localized in the vertex. On January 2, 1922, he noticed a buzzing in the left ear but no pain. This buzzing continued and on February 20, 1922, the pain in his head became more marked and neuralgic in nature. On March 15, 1922, the pains became localized in the left ear, and on that day the ear began to discharge pus. This discharge varied in amount but generally it was very copious. Syringing the ear seemed to relieve the pain.

On March 30, 1922, we first saw the patient. For the few preceding days the pain in his ear had become worse and the discharge was very irregular. The patient felt so badly that it was

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necessary to come to the office in a taxi, though the distance from his home was short.

Examination: The temperature was 98.6°. The right ear was of good appearance. Left ear: Tenderness was elicited on pressure over the mastoid. Tenderness was particularly marked on pressure over the left sterno-cleido mastoid. There was no swelling over the mastoid or in the soft tissue. The canal was filled with pus. This was not malodorous. The canal wall was much reddened. There was no sinking of the superior-posterior portion. There was a large perforation in the lower anterior portion of the drum. The drum was congested but there was no bulging. Hearing was greatly diminished particularly for low notes. Rinnê was negative. Note: During the examination the patient fainted.

The patient was sent to the Baltimore Eye, Ear and Throat Hospital that same day. He was put to bed and the ear was irrigated with boric acid every two hours with the Fowler irrigator. The pain diminished and the discharge became less abundant. The tenderness over the mastoid and the sterno-cleido mastoid persisted, however, and the patient continued to complain of the pain in his head. He was discharged from the hospital on April 12. During this time from March 30 to April 12, his temperature was never above 99°.

On April 16, 1922, the patient was seen at the office. The pain in his left ear had become more severe, and as the drum perforation was very small a paracentesis was done under local anesthesia. Thick pus was obtained. The patient was seen every day. Boric acid irrigation was prescribed and at the office suction and mercurochrome applications were used. The patient seemed to improve steadily and on April 29, the drum was intact and there was no pain in the ear. However, the "neuralgia" in his head persisted. Between May 1 and May 13, Politzerization was done four times. On May 14, the patient came to the office with a very profuse discharge of pus. The ear had pained him all night and was relieved only with the beginning of the discharge the next morning. Examination showed the pus pulsating from a perforation in the lower anterior quadrant. The discharge continued to be very profuse. On May 17, the tenderness over the mastoid was not marked, but there was exquisite tenderness over the sterno-cleido castoid below the tip. There was no swelling. As the discharge continued most profusely the patient was re-admitted to the hospital on May 22, though he protested he was not sick enough to go.

On May 23, 1922, a simple mastoid operation was done under ether anesthesia. The usual post-auricular incision was made. The cortex was found to be intact and very thick. The mastoid was unusually sclerotic. A large zygomatic cell was soon uncovered. The antrum was found by curetting upwards from another large cell which extended toward the anterior and internal portion of the tip. This cell was filled with granulation. It was in a very unusual position, being exceedingly deep and very far forward. So far as could be found its walls were intact. *No free pus was obtained and no communication with the soft tissue was located through the cortex.*

The antrum was filled with granulation. There was no exposure of dura. The sinus was exposed for about 0.5 cm. in the region of the bend. The wound was only partially closed from the upper angle. On the night of the operation it was noted that the patient was hoarse and that he was troubled with the accumulation of mucus in his throat.

On May 23, an examination of his throat showed the uvula pointing to his right side and no movement of the left side of the soft palate. The hoarseness was marked. A view of the larynx could not be obtained by indirect examination. The tongue was protruded to the left. Except for a rise of temperature to 102° (rectal) on May 25, the temperature never rose above 100° (rectal). The patient complained of much pain in his head, particularly in the left occipital region. There was no difficulty or pain in the movements of the head in all directions. Repeated ophthalmoscopic examination gave negative results.

On May 29, the first mastoid dressing was done. It was striking to find a profuse amount of pus in the auditory canal but no pus in the mastoid wound. Tenderness could be elicited on pressure over the sterno-cleido mastoid, but there was no swelling. The ear continued to discharge freely. At this time the patient had several periods when he became irrational. The patient complained of difficulty in swallowing and he was much annoyed by the accumulation of mucus in his throat. An examination of his throat showed a swelling of the pharynx behind the left posterior pillar.

On June 1, this swelling had become definitely larger extending about one inch up into the naso-pharynx and downwards into the laryngo-pharynx. It was impossible to see the larynx by indirect examination. The swelling was incised and probed with a Kelly clamp and about three drams of thick pus were evacuated.

On the next day a good view of the larynx was obtained and while the right cord and arytenoid functioned well there was a complete fixation of the left cord and arytenoid, with the cord in the cadaveric position.

On June 3, the profuse discharge from the auditory canal had ceased entirely. The retro-pharyngeal abscess was kept draining. The patient improved steadily and on June 9 he was discharged from the hospital. He was seen at his home regularly and the mastoid wound dressed.

On June 26, there was a recurrence of the excessive mucus collection in the throat and the dysphagia which had improved became more marked. An examination of the throat showed no change in the condition of the paralysis of his larynx, pharynx or tongue. The patient had developed an indurated swelling about two inches by four inches in the left posterior cervical triangle along the posterior border of the sterno-mastoid. Applications of heat were made. The retropharyngeal swelling had disappeared as seen from the mouth. However, on examination with the naso-pharyngoscope, a swelling could be seen just anterior to the left Eustachian orifice and extending upwards about one inch. In the middle of this swelling there was a bead of pus. A probe was introduced into this and an opening determined but extensive probing could not be done. The swelling in the neck became steadily smaller; the mastoid wound healed very satisfactorily. Difficulty in swallowing continued.

On August 30, distinct movement of the left side of the palate was observed, and the patient said that his swallowing was much more comfortable. The patient was last seen on December 18. He has been back at work since September. The ear is entirely well and there is no swelling in the neck. The hearing is improved. The pharyngeal musculature functions well. The tongue is protuded to the left. There is no facial involvement. While there has been a compensatory improvement in the voice, the left arytenoid shows very slight movement and the left cord is fixed in the cadaveric position.

The naso-pharynx is of good appearance. There is no dysphagia and the patient has gained weight.

Discussion: The factors which make possible this unusual spread of pus from the middle ear cavity may be grouped according to Beck[1] under four heads, as follows: (1) Loci minores resistance which occur normally. (2) Unusual clefts and fissures which occur anatomically or which have not closed. (3) A

breaking down process of the surrounding bone. (4) The lymph drainage of the middle ear.

1. We will consider the normal loci minores resistentiae.

A. In the auditory canal there are: a. The fibrous tissue connection between the bony and cartilaginous canal. b. The incisurae santorini in the cartilaginous portion. This is an important communication between the canal and the parotid gland. c. The superior, posterior canal wall is separated from the adjacent mastoid cells by a layer of bone which is often of the thinness of paper. d. In the region of the posterior wall where the tympanum projects on the mastoid process, connective tissue bands and vessels communicate from the mastoid cells through small bony canals with the auditory canal. e. The parotid gland through its topographical relations plays an important role in the spread of pus from the middle ear. The parotid gland is so closely attached to the cartilaginous canal that it is separated from the perichondrium with difficulty. f. The tempero maxillary articulation, which is separated from the canal wall by connective tissue. B. In the mastoid process: a. The thinnest portion of the cortex is on the medial side and in the region of the incisura mastoidea. b. The cells near the stylo-mastoid foramen and the mandibular fossa.

2. The unusual clefts and fissures are either anatomical anomalies or persistent embryological remains. The most frequent finding is a peristent squamous mastoid suture. This usually closes at the end of foetal life or in the course of the first year of life. In 200 mastoids Bezold[2] found four completely open and forty-one partially open squamous mastoid sutures. In 239 mastoids Moos[3] found three complete and fifty-four incomplete squamous mastoid sutures. Kirchner[4] in 300 skulls of adults and 30 skulls of children, most of which were new born, found a bilateral completely open squamous mastoid suture in 6.6 per cent of the cases examined.

There are found in the literature isolated cases of other fissures in the mastoid.

Hyrtl[5] reports two such dehiscences. Zuckerkandl[6] describes a case in which five small holes in the external auditory canal led into the mastoid cells. He reports, too, dehiscences leading from the auditory canal into the antrum in 4 of 200 mastoids which he examined. However, pus breaks through the mastoid mainly through (a) A patency of the squamous mastoid suture (b) Dehiscences in the lamina externa. Occasionally a dehiscence in the floor of the antrum occurs, and dehiscences in the

posterior wall of the carotid canal and in the tegmen tympani are reported.

3. The breaking through of pus following the destruction of the surrounding bone is not only dependent upon the pus pressure; the virulence of the invading organism is a most important factor.*

4. The remaining path of spread of pus from the middle ear is through the lymph system. Most[18] has shown that the lymph vessels of the middle ear are connected with the lymph vessels of the lateral pharyngeal wall through the lymph capillaries of the Eustachian tube. There is a continuous capillary network which stretches from the pinna and external auditory canal through the drum, middle ear, antrum and Eustachian tube to the pharynx.

There are two possible ways for lymph drainage to occur in otitis media: (a) Through the drum to the lymphatics of the external ear. (b) To the Eustachian tube, *i. e.* to the lateral retro pharyngeal glands, which are the regional glands of the Eustachian tube. According to Most[18] the first method is more usual in adults while the second occurs more frequently in children.

Now that we have considered the paths by which an abscess can spread from the middle ear, let us invesigate the paths along which the pus can travel after leaving the temporal bone.

Bezold[8] injected colored gelatin in his experiments and found that the gelatin spread from the insertion of the sterno-cleido mastoid first anteriorly along the belly of the digastric, filling the retro-maxillary region and then backwards into the neck. Here the gelatin pressed into the interstices of the neck muscles and assembled in three places: (1) Between the trapezius muscle and the splenius muscle, (2) between the splenius and the complexus magnus, and, (3) between the latter and the small inter vertebral muscles to the level of the second thoracic vertebra.

Englehardt[9] saw a case with a spread of pus as outlined above, in which, however, the abscess had its origin in a chronic inflammatory disease of the base of the skull and particularly the superior cervical vertebra. If the pus has reached the incisura digastrica then it spreads—first anteriorly into the retro-maxillary fossa and toward the chin, then posteriorly along the occipital artery which runs along

*In his experiments on guinea pigs, Haymann[7] found the following: In 11 bones infected with streptococus pyogenes bone destruction occurred 5 times. In 12 bones infected with streptococus mucosus bone destruction occurred 8 times. In 12 bones infected with staphlyococus bone destruction occurred 2 times. In 6 bones infected with pneumococcus bone destruction occurred 9 times. In 11 bones infected with diphtheria bacillus bone restruction occurred 5 times. In 10 bones infected with pyecyaneus bone destruction occurred 8 times. In 4 bones infected with typhoid bacillus bone destruction occurred 1 time. In 2 bones infected with gonococcus bone destruction occurred 0 times. Of these cases the bone destruction led to an extension of the abscess 16 times.

the inner side of the digastric muscle. The mastoid abscesses which break through the inner side according to Bezold[8], show no tendency to spread in the retro-visceral regions. Bezold[8] explains this by the relations of the digastric muscles to the deep cervical fascia.

A very frequent place of rupture is the anterior-external surface of the mastoid process. In these cases the pus spreads either in the sheath of the sterno-cleido mastoid or further in the vessel sheath and makes its appearance above the clavicle or very rarely in the axillary fossa.

Occasionally there is observed a discharge of pus above the crista temporalis from the cortical cells of the temporal bone. However, the spread of these abscesses does not offer any differential diagnostic difficulties.*

Of the vessels along which pus may spread the internal jugular vein and the mastoid emissary are especially to be considered. The pus gets into these tracts either directly after breaking through the mastoid, auditory canal or antrum or indirectly after passing through the middle or posterior fossa of the skull. Kessel[11] cites a case in which an otogenic extradural abscess travelled out from the cerebellum to the anterior border of the foramen and then formed a retro-pharyngeal abscess.

Concerning the formation of a retro-pharyngeal abscess as the extension of purulent otitis media, Bezold[8] and others state that it can only result from an acute otitis media.*

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*To understand the spread of otogenic abscesses into the neck it is convenient to divide the neck into four regions, as follows: (1) Retro-visceral space (unilateral); (2) Pre-visceral space (unilateral); (3) Vessel space (bilateral); (4) Inter-muscular space (bilateral). (From Beck[2]).

Retro-Visceral Space. The retro-visceral space lies between the pharynx and oesophagus anteriorly and the cervical vertebra posteriorly. It is filled with loose connective tissue. At the level of the cricoid it is circular so that it surrounds the oesophagus. Inferiorly the retro-visceral space is continued into the posterior mediastinum. At the aortic arch the retro and pre-visceral spaces as well as the vessel space all communicate with the thoracic cavity and they are connected with one another. They communicate also with the subcutaneous connective tissues. In the region between the pleural apices the three spaces are only slightly separated. However, the pericardium separates them again anteriorly and posteriorly.

The inter-muscular space is in relation superiorly with the connective tissue between the sterno-cleido mastoid and the trapezius over the clavicle, and inferiorly with the inter-muscular tissue of the axillary fossa. In important relation to this space is the deep layer of cervical fascia between the omohyoid, sterno-hyoid, and clavicle. This fascia reaches only to the binding tendon of the onohyoid, so that there is free communication between the intermuscular space and the vessel space at this point. The direction of burrowing from the intermuscular space then follows: (1) Toward the superficial tissue in the space between the sterno-cleido mastoid and trapezius. From here it extends under the platysma over the scapula to the chest. (2) Superiorly around the tendons of the omohyoid into the vessel space. (3) Inferiorly around the same tendons to the scalenus muscle over the subclavian veins into the axillary fossa.

*Other causes of retro-pharyngeal abscess are: (1) Injury to the pharynx or esophagus with primary or secondary infection; (2) Caries of the cervical vertebrae; (3) Abscess of the retro-pharyngeal lymph glands which drain the pharynx and palate.

Schwartz[10] and Hartmann[10] say that the new bone formation is so intensive in chronic otitis media that eventually all of the bone cells are filled in and the diploe of the mastoid at the tip and the inner wall is so thickened that it is very rare for pus to break through. As we have said above it is possible for the pus to go through a dehiscence in the tegmen tympani and upwards into the middle or posterior fossa. From the middle fossa it may go downwards through the foramen ovale, foramen rotundum, or the posterior lacerated foramen. From the posterior fossa the pus can go through the foramen magnum or through the jugular foramen and then spread posteriorly to the attachments of the short, deep neck muscles. Anteriorly it spreads to the anterior side of the vertebrae up to the level of the esophagus, where the pharyngeal space is very narrow.

In this manner the nerves running into the jugular foramen can be injured so that paralysis occurs.

Kessel[11] describes a case in which complete tongue paralysis, difficult breathing, aphasia and rapid rise of pulse were observed.

The indirect method of spread of the otogenic abscess through the skull to the retro-pharyngeal region is rare; the direct route is much more frequent. The pus can burrow through the floor of the antrum particularly the anterior canal wall, rupture into the mandibular joint and spread into the deeper tissue. On the other hand it may reach the posterior fossa and from there spread inferiorly. The path along which the pus spreads may be partly preformed, *i. e.*, by vessel routes or may be due to bone destruction. The occipito-mastoid suture is a favorite rupture point particularly when the mastoid cells reach to the suture and into the occiput.

When the Eustachian tube is closed a rupture through to the soft tissues of neck can occur.

According to Haug[12a] there is a pressure of pus into the peritubal tissue and he believes in this manner the semi-canalis tensoris tympani becomes a conductor of the pus from the middle ear to the pharynx. Under such circumstances it is possible to have the formation of a retro-pharyngeal abscess without any pus in the mastoid.

Blau[13] reports such a case. However, Muck[14], Klug[14] and others have shown that a direct breaking through of an osteomyelitic or tuberculous focus of the diseased temporal bone into the pharynx is possible.

Muck[14] describes a case in which five weeks after the beginning of an acute purulent otitis media there occurred a mastoiditis and then osteomyelitis of the spongy bone in the region of the labyrinth and in the petrous portion of the temporal bone. This finally lead

to a formation of an extradural abscess and to direct rupture into the pharynx with the formation of a retro-pharyngeal abscess. Perisinus abscesses particularly the peribulbar variety spread horizontally under the base of the skull and frequently break through into the retro-pharyngeal space. (Jansen in Blan's "Enzyklopâdie der Ohrenheilkunde"). Jansen says also that occasionally a wide spread gangrene of the jugular wall following bulbar thrombosis forms great foci of pus which press forward to form a retro-pharyngeal abscess.

A. Haug[12b] describes a case in which a Bezold mastoiditis wandered from its usual course to form a retro-pharyngeal abscess. The case was that of an acute purulent otitis media in a seventeen-year-old boy. The pus had an outlet under the mastoid with wide-spread infiltration far into the occipital region. At operation a large pus pocket was found extending inferiorly and posteriorly from the tip of the mastoid. A second incision was made in the direction of the sterno-cleido mastoid and drainage for the deep-lying abscess established. It was found also that the pus had broken through medially and inferiorly from the antrum into the peritubal tissue and spread to the levator veli (which is partly bound to the tube) so that the palate, tonsils and pharynx formed a swelling larger than an egg. By pharyngeal incision a teaspoonfull of thick pus was obtained. Then only did the general improvement take place. Haug was able to culture pure pneumo-bacillus from both the retro-pharyngeal abscess and from the mastoid; thus showing a definite relationship.

Schultze[15] reports a case of sinus thrombosis which lead to the formation of an abscess in the deep fascia between the occiput and the first cervical vertebra.

Deutschlander[16] reports a case of chronic middle ear suppuration with extradural abscess in which the abscess extended to the atlanto-occipital joint.

Leutert[17] in 1896 reported from the Halle Clinic a case of brain abscess in the occipital lobe, sinus thrombosis and wide spread extradural suppuration which caused a carious disease of the vertebrae.

Because of the similarity of the localization of the otogenic retro-pharyngeal abscess and the abscess arising from sub-occipital inflammations a confusion of the diagnosis of the two processes is not rare. It is important then to emphasize the differentiating features. In an otogenic abscess the pharyngeal swelling usually remains unilateral as a boundary is set by the ligamentum nuchae, only rarely in deep suppurations under the periosteum is the mid line over-reached. In the suboccipital sup-

purations the pharyngeal swelling is usually bilateral with involvement of the atlanto-occipital joint. In involvement of the atlanto-occipital joint the head is usually bent forward so as to spare the joint. In unilateral involvement usually the head is bent to the one side or the other. In the severer cases of retro-pharyngeal abscesses the head is bent forward to free the laryngeal passage and facilitate breathing. The pain in suboccipital inflammations is usually in the back of the head and then spreads into the skull.

It is important to keep both conditions in mind as an infection of the base of the skull can cause ear suppuration and an otogenic retro-pharyngeal abscess can cause suboccipital inflammation. Such cases have been reported by Grünwald[19], Englehart[9] and Leutert[17].

Prognosis: If diagnosed and treated sufficiently early, and if the ear disease per se does not have an unfavorable complication, the prognosis of an otogenic burrowing abscess is decidedly favorable.

The second case was that of a young man, twenty-six years of age, who had been operated on for a streptociccic mastoiditis on April 17, 1922. At the operation Dr. Perkins of Winston-Salem, by whom the case was referred to us, reported "there was a considerable necrosis of the mastoid cells but nothing out of the ordinary." As the patient ran temperature for ten days after the operation, his doctor cleaned out the wound, finding only excessive granulations. The discharge from the external auditory canal continued to be very profuse and there developed in May sensitiveness to light in the left eye, some pain in the left eye and diplopia. The wound was again cleaned out and Dr. Perkins wrote he was positive all diseased cells were thoroughly cleaned. After this last operative procedure there was considerable labyrinth irritation, but this cleared up. We first saw the patient on June 21, 1922 (two months after operation). He complained of severe headache, which he localized in the left temporo-parietal region. He had a paralysis of the left external rectus. The eye-grounds were normal; there were no indications of congestion. There was a moderate discharge of pus from the left external auditory canal and a small mass of granulations could be seen in the anterior-superior quadrant. He had no rise of temperature. The patient was referred back to his physician and irrigation, suction, and instillation of alcohol advised. The patient ran an irregular course of recovery. The temperature never rose above 101°, but there were recurring attacks of headache. By September, however, the mastoid was entirely healed, the ear was dry and the diplopia and headache had entirely disappeared.

In 1904, Gradenigo[20], on the basis of eight cases of his own, and on the report of fifteen others, introduced a symptom complex which occurred in the course of an acute otitis media with and without perforation of the drum. This complex consisted of diplopia due to homolateral abducens paralysis and intense pain in the temporo-parietal region of the affected side. Often, however, it was complicated by meningitic manifestations. The outcome of these cases were two deaths due to suppurative meningitis and nineteen recoveries. The recoveries were for the most part spontaneous, but occurred only after several weeks or months. Gradenigo then thought the abducens paralysis was due to a basal meningitis, either serous or purulent. In 1908, Gradenigo[25], adds that in exceptional cases it may occur in the acute exacerbations of chronic purulent otitis media. In about half the cases accessory symptoms are present due to irritation of the trigeminus and the oculo-motor or to irritation of the dura. In this publication he gives the following explanation of the pathological process: This consists, of the spreading of a purulent infection of the antrum to the tip of the petrous bone by way of the peritubal pneumatic spaces and the carotid canal. The abducens is involved at the tip of the pyramid immediately after its exit from the dura matter and involvement is due to an osteitis and pachymeningitis limited to the tip of the petrous bone. The extradural localization of the disease accounts for the usual favorable course. Gradenigo says, however, that all of the abducens paralyses which occur in the course of an acute otitis media are not to be explained in this manner. Another frequent cause is an extradural abscess on the superior border of the petrous bone which spreads toward the tip of the bone causing diffuse osteo-myelitic changes.

After Gradenigo had called attention to this symptom complex, many observers reported similar findings and soon it became evident that the Gradenigo syndrome was not as rare as originally supposed. There arose, however, a great diversity of opinion as to the explanation of the pathology and lately it has been denied that the Gradenigo complex has any claims as a clinical entity. Herbert Vogel[27]* has reviewed in a very thorough manner, the literature up to August 1921. One hundred and twenty-nine cases have been reported and most of these were in young individuals. From 1905 to August 1921, seventeen observers have recorded in the literature their objection to accepting the Gradenigo symptom complex as a clinical entity.

The following explanations of the pathology of the abducens paralysis have been advanced: (1) Osteitis of the tip of the petrous process. (2) Circumscribed meningitis, about the tip of the petrous

bone. (3) Diffuse meningitis. (4) Toxic or inflammatory neuritis. (5) Compression.

Five autopsy reports of these cases are given. In the majority of the cases no alteration in the tip of the petrous bone was found. On the other hand, there are a great number of cases reported in which deep-lying abscesses on the petrous tip or disease of this portion of the bone were found, and yet in the clinical picture there was no abducens paralysis. In addition the operation reports of these cases do not support Gradenigo's viewpoint. Most of the operated cases show, (1) pus in the mastoid cells, (2) extradural abscesses, (3) sinus thrombosis, (4) cholesteatoma, (5) labyrinth disease.

Vogel concludes that the Gradenigo syndrome is to be struck from the nomenclature as a clinical entity. There is no proof that the etiology of the complex lies in disease of the tip of the petrous bone. He believes that the otogenic, abducens paralysis is in the majority of instances, a sign of a mild meningitis. It is not to be regarded per se—as an indication for operative attack of the petrous tip.

More recently Knick of Leipzig[28], has reported six cases of abducens paralysis occurring in acute otitis media—with and without mastoiditis. Only in one of these cases could the author find serous meningitis as determined by careful examination of the spinal fluid. In this case the spinal fluid was under increased pressure and contained an increased amount of albumen and a slightly greater number of cells. This case is apparently similar to those of Cushing's which we will mention later. It is to be noted that it was in this case only that choked disc was found. Knick contends that the meningitis origin of the sixth nerve paralysis can not be demonstrated for the great majority of the cases, and moreover the hypothesis of an extradural injury of the nerve by inflammatory disease at the tip of the petrous bone becomes improbable. The negative spinal fluid findings and the abscence of meningitic symptoms warrants the assumption of an extradural toxic—infectious injury—probably from the perilabyrinthian cells in the tip of the pyramid. Knick says if the abducens paralysis occurs in the late stages of mastoiditis or several weeks after mastoiditis or several weeks after mastoidectomy then it is possible that the sixth nerve paralysis is an indication of a serious bone disease originating in the deep-lying perilabyrinth cells. In sixth nerve palsy, operation is indicated only when there is a mastoiditis or signs of a beginning meningitis with positive spinal fluid

*An extensive bibliography to be found in this publication.

findings. In a discussion of this paper Vogel[28] again maintains that the majority of the cases of otogenic sixth nerve paralysis are to be regarded as mild meningitis. This view is strengthened by the cases of bilateral and contra-lateral paralyses. Ten to fifteen such cases have been reported in the literature.

Harvey Cushing[29] attributes the Gradenigo sixth nerve paralysis to a cerebral oedema. In the several (number not given) cases he saw, all of the patients showed headache, vomiting and a low grade of choked disc. Cushing says these oedemas are presumably akin to the meningitis serosa of Quincke. In most of his cases a lumbar puncture or a sub-temporal decompression not only relieved the pressure symptoms but led to a rapid subsidence of the diplopia. The spinal fluid in all these cases was sterile. "It is not improbable, therefore," says Cushing, "that disturbances of this kind may be ascribed to some swelling and edema of the brain stem which has brought about the same constricting effect on the part of the cerebellar arteries that we have described as existing in cases of brain tumor." Cushing advances the view that the occurrence of internal squint in case of brain tumor may be due to strangulation of the nerve by transverse branches of the basilar artery. This view is supported by his findings: (1) that the arteries, contrary to the usual anatomical description, generally overlie the nerves; (2) that in a series of brains of tumor cases, the vessels which normally encircle the brain stem often produce a more or less deep grooving of the nervous tissues; (3) that the abducens in many of these cases is deeply constricted, and, (4) that a large percentage of the clinical histories of cases which show post-mortem, a positive grooving with accompanying implication of the nerves, record either subjective diplopia or the actual presence of a convergent squint observed during life.

We are convinced that a variety of cases is included under the term Gradenigo complex by different writers. While Cushing found choked disc present in every case of abducens paralysis, a large number of cases are reported by others without choked disc. Gradenigo, himself, does not mention choked disc. We are quite ready to accept Cushing's explanation for the class of cases he describes and which, as we shall point out later, in discussing choked disc, are due to intra-cranial edema or serous meningitis. For other cases without any signs of intra-cranial edema, Knick's studies make the theory of meningitis highly improbable. We will not venture an explanation.

The form of abducens complication described by Gradenigo does not include all forms of abducens involvement. Wildbrand and

Saenger[30] have collected all the cases published up to 1921 of bilateral abducens paralysis, of abducens paralysis on the opposite side and of abducens paralysis following otitis externa. Wildbrand and Saenger also refer to cases of oculo motor paralysis—total or more generally partial, cases of isolated ptosis, and others of mydriasis, all associated with otitis media.

Mollison[31] has described two children with third nerve involvement; one with acute otitis media, the other with chronic otitis media. In both of these cases recovery followed in about six weeks after free opening of the mastoid.

Aboulker[40] has reported a case of otitis media and mastoiditis accompanied by paralysis of the sixth, ninth and twelfth nerves. There was no evidence of any meningeal invasion or intra-cranial abscess. Aboulker calls it the apexo-condylo-laceratum complex.

The optic nerve does not commonly show changes in cases of intra-cranial involvement from otitis media. This is the view generally held and is in accord with our experience; but opposing views have been expressed by eminent writers. The subject is discussed in detail by Wildbrand and Saenger.*

Koerner[34] found choked disc once and optic neuritis twice in twenty-one cases of uncomplicated intra-cranial affection (extradural abscess); but he found one case of choked disc and five of optic neuritis in thirteen cases of complicated intra-cranial involvement. The conclusion is that change in the nerve-head in otogenic purulent inflammation within the cerebral cavity are much more frequently absent than present, but combinations of intra-cranial affections produce trouble more frequently than uncomplicated. The optic nerve involvement is always binocular.

Bezold[35] reported that twenty-three per cent of cases of acute otitis media (one hundred cases) showed changes in the optic nerves.

Neumann[36] on the other hand, states that optic nerve changes are frequently associated with intra-cranial complications and Zaufal maintains that they are always present. To the writers their statements appear greatly exaggerated.

There has been much confusion concerning the kind of optic nerve affection found by reason of the varied use of the term "optic neuritis." The term is frequently used to signify a mild congestion of the optic disc, sometimes the early stages of choked disc. It is

*Sessons[32] reported: 31 cases of extradural abscess with normal eye-grounds. In 13 cases of purulent leptomeningitis there were 4 cases of optic nerve involvement. In 21 cases of sinus thrombosis, 10 showed optic nerve involvement. In 25 cases of cerebral abscess, 13 showed normal eye-grounds and 12 showed optic nerve changes.

not possible, therefore, to give accurately the relative frequency of descending optic neuritis and of choked disc (papilledoma). Hansen's[37] figures for one hundred cases are twenty-three per cent optic neuritis and three per cent choked disc.

The clinical significance of optic nerve changes is variously interpreted. Hansen[37] believes that they always point to intra-cranial involvement, while Koerner and Jansen[34] oppose this view, the latter maintaining that choked disc may occur in uncomplicated empyema of the mastoid cells.

There were reported in a paper read before this society in 1915, by Friedenwald and Downey[38], two cases of choked disc following mastoid operations in which the lateral sinus was opened. In the first case there were no signs of lateral sinus thrombosis before the operation; a profuse hemorrhage followed injury of the exposed lateral sinus wall, which was covered with granulations. On the fifth day after this operation choked disc developed associated with abducens paralysis. It was allowed to run its course resulting in permanent reduction of vision in the right eye to 16/30, in the left to 10/100; the otitis was on the left side.*

In the second case an operation was performed for acute mastoiditis on the right side; six days later the internal jugular was tied and the lateral sinus opened. Six days afterward beginning choked disc was noted which increased rapidly, more marked on the side of the affected ear. Fifteen days later a right subtemporal decompression was performed with complete recovery of vision, which had been markedly reduced.**

Auberbach and Alexander "offer a mechanical explanation of choked disc . . . as the result of interference with the venous outflow." "There is a damming up of the blood and consequent edema of brain, increase of intra-cranial pressure and its resulting symptoms."*

The writers are convinced of the correctness of this explanation of increase of intra-cranial pressure due to venous engorgement and the resulting cerebral and meningeal edema, which should not be termed serous meningitis.

*It is of interest to state that Wildbrand and Saenger regard outspoken post-operative choked disc associated with sinus thrombosis as giving a good prognosis both as to general recovery and as to sight. We cannot confirm the statement as to sight which may be greatly and permanently injured.

**Auerbach and Alexander, they learned later, had published a similar case of choked disc, with paralysis of the abducens and facial nerves, in which likewise a decompression operation had been done with success.

A number of smilar cases have been reported as following the mastoid operation. Menche[39] marked papillitis after mastoid operation—complete recovery. Castanada[40], mastoid operation—fourteen days later right abducens paralysis and double choked disc.

Summary: Two cases of otitis media have been presented. In the first case there was an extension of pus from the middle ear to the retro-pharyngeal region with involvement of a number of cranial nerves. In the second case paralysis of the homolateral abducens occurred following mastoiditis.

In the first case we have to account for: (1) Paralysis of the left palatine arch. (2) Paralysis of the left side of the tongue. (3) Paralysis of the left vocal chord and arytenoid.

As there was no pus in the mastoid or antrum we can at once dismiss them from the consideration of the pus extension. There was no fissure in the external auditory canal and the pus came definitely from the middle ear. If the lymph system had served as the route of extension we should have expected more evidence of cervical adenitis. Only one gland in the posterior triangle became manifestly involved—and that occurred very late in the convalescence. It would seem probable that the Eustachian tube, the peritubal tissue and the semi-canalis tensoris tympani served as the route for the extension of the pus from the middle ear to the retro-pharyngeal region. A retro-pharyngeal abscess at this level could press directly upon the glosso-pharyngeal, vagus, accessory and hypoglossal nerves—and such pressure would explain all of the lesions in the first case.

The abducens paralysis in the second case is more difficult to explain. There was no evidence of intra-cranial edema; so that Cushing's explanation, which we believe is the most logical for most cases of this type, is not applicable in this case. Knick's studies make the theory of serous meningitis a doubtful explanation. The spontaneous recovery would argue against osseous involvement at the tip of the petrous bone. The most likely explanation would seem to be a toxic neuritis due to retention of pus. This would also serve to explain the rises of temperature and the severe headaches.

If we summarize the cranial nerves reported involved in otitis media, we have the following: (1) Optic; (2) Oculo-motor; (3) Trigeminus; (4) Abducens; (5) Facial; (6) Acousticus; (7) Glossopharyngeus; (8) Vagus; (9) Accessorius; (10) Hypoglossus. Involvement of ten of the twelve cranial nerves has been observed in an extension of otitis media.

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INDICATIONS FOR MASTOID OPERATIONS UNDER LOCAL ANESTHESIA.*

DR. PHILIP S. STOUT, Philadelphia, Pa.

Looking backward from time to time is a good thing, providing we carefully consider the failures of ourselves and others, and resolving therefrom an earnest desire to try to avoid similar happenings in the future.

If I may be pardoned for a personal reference, I happen to be one of a family of five, all of whom have been associated with medicine in one way or another. Therefore medicine and the various happenings from operations have been the table talk of our family since I have been a mere child. I can easily look back thirty-five years and see the various results, good, bad, and indifferent, following the operations on the mastoid. Looking back I can see quite a number of cases that proved fatal, which I now believe might have been saved had local anesthesia been employed, as, for instance, several cases, to my knowledge, that developed acute nephritis and died, others pneumonia and death, others diabetic coma and death, little children who never awoke from the ether, again, others who developed active tuberculosis after the operation and died in a few months. These, I say, looking back over thirty-five years, stand out as unpleasant happenings. The mastoid operations were so dangerous, in fact, that the laity even today have an unusual fear of the operation and usually say in their conversation that it should be avoided if possible, because of its great danger.

Nearly thirty years ago, 1894, Schleich showed that chiseling the mastoid process could be performed painlessly under local anesthesia. Two others followed, Hoffman and Noack, tried it and gave it up because they found it gave too much discomfort to the patient.

In 1901, Alexander published a small series of cases but was not very enthusiastic over its use. He was then afraid to use a strong cocain solution to desensitize the drumhead and tympanic cavity, therefore the operation was rather painful and to be recommended only in cases where narcosis was contra-indi-

*Presented at the May, 1923, meeting of the Philadelphia Laryngological Society.

*Accepted for publication in "The Laryngoscope", July 23, 1923.

cated. A number of Austrian, German, and French otologists used it with varying success. I am quoting liberally from an article by Holmgrem published in 1922. Twenty-one years after Schleich made the announcement, three otologists pronounced themselves in favor of the local anesthesia method of doing mastoid operations at the Amsterdam meeting of the otolaryngologists. Naturally there were many there who opposed it. In 1916, Pogany reported one hundred operations and since that time there have been many others who have done this operation a great many times. They include, Barany of Upsala; Naumann, Alexander, and Fisher of Vienna; Porter, Koebbe, and Goldstein of America. I feel sure that the number of operations to date would amount to several thousand.

So this has taken the usual four great steps in every movement: 1. Suggested; 2. Critisized; 3. Reflected upon; 4. Finally adopted.

As to the indications for the use of local anesthesia, it is needless to say that as far as the pathology is concerned it is the same for local anesthesia as for general.

Special indications are: 1. Age, under one year of age. This, I think, will make some of you wonder, but the brain surgeons who are doing everything in their power to reduce the mortality have adopted this method and I believe they are quite right. It is interesting to note here that the brain surgeons will soon be doing all their work for practically all ages under local anesthesia. 2. Tuberculosis of the lungs. No one can say they are willing to give ether or chloroform to a person with latent or active tuberculosis of the lungs. 3. In pneumonia, lung abscesses, chronic bronchitis, various asthmatic conditions, severe hay fever, bronchiectasis, and acute pleurisy. 4. Measles, scarlet fever, diphtheria, whooping cough, typhoid fever. 5. Goiter, or any other tumor or condition of the neck, trachea, or larynx that would interfere with general anesthesia. Acute tonsillitis, hyper-thyroidism, hypo-thyroidism, enlarged thymus, statis lymphaticus. 6. Severe anemias, from whatever cause. 7. Cardiac cases, aneurysm, phlebitis. 8. Cardio-renal, high blood pressure cases. 9. Apoplexy, epilepsy. 10. Renal cases. 11. Pregancy. 12. Diabetes mellitus. 13. Alcoholics and drug addicts. 14. Brain conditions associated with mastoiditis such as brain abscesses, tumor, sinus thrombosis, meningitis, lepto-meningitis, sleeping sickness. 15. Where there is a great fear of general anesthesia. 16. Obese, very weak, the aged.

Allow me to quote a typical case: Cordelia C., age 33, colored, Philadelphia General Hospital, Operation January 27, 1923.

Patient was admitted twelve days before the operation with bilateral tuberculosis of the lungs and she was also suffering from the drug habit.

Shortly after she was admitted she began to have pain in the right ear. Whether she suffered with this pain before entering the hospital I am not sure, since the history prior to coming to the hospital was vague. The pain became more and more severe until it appeared that she had acute otitis media and a consultation with the otolaryngologists was requested by the medical chief in charge. It was found that, at that time, she had an acute drum and tenderness over the mastoid area. Her temperature on the 26th, the day before the operation, was up to 103°. She was seen the first time some three or four days prior to the operation by the otolaryngologist and the drumhead was incised. Nothing came from the incision except a few drops of blood and possibly a little bit of purulent matter later, but no frank discharge. The pain over the mastoid became much more severe and it appeared to be a case where a mastoid operation was indicated.

X-rays were made and the report showed obliteration of the cells of the right side. The diagnosis, mastoiditis, was confirmed by the Roentgenologist.

Blood showed 19,000 leukocytes.

It is interesting to note that she also had tuberculous laryngitis.

Her Wassermann was negative.

Sputum positive T. B.

This case seemed to be a typical case for local mastoid operation. We, therefore, put the matter up to her and she consented to have it done in that manner.

We used the following technique:

The side of the head and ear and the skin over the mastoid area was prepared in the usual manner.

One hour before the operation the patient was given 1/4 of a grain of morphia and 1/150 grain of atrophine.

The local anesthesia used was 1 per cent novocain with three drops of adrenalin chloride solution 1/1000 to each dram. I am conscious of the fact that many operators advise more adrenalin chloride solution 1/1000 to be used, but you can use your own judgment in

the matter. The skin is infiltrated from one half an inch below the mastoid tip to the top of the ear and around to the front about the position of the tragus. Then the deeper structures are infiltrated, and, if possible, and I believe it is possible, to get under the periosteum and infiltrate there as much as possible, along the line of incision. This, I believe, will be as far as you need to go until making the incision.

The next step after making the incision is to pass the needle down at the lower part of the external canal, which faces the incision, and inject some of the solution in that region. Now, I believe, for the next step a good one is to put some local anesthesia on the drum the same as if making an incision in the drum. This should not be left in there any longer than ten minutes.

Now you are ready to begin work. Push back periosteum and chiseling of the bone, as you know, is a more or less painless proceeding providing the gouges and chisels are absolutely sharp. It is criminal to use dull instruments in this operation. You should also use a wooden mallet. You should proceed carefully and considerately, remembering constantly that the patient is not asleep. In fact, I feel it is probably a good thing to keep up a quiet conversation with the patient, speaking of other things. If ever it is necessary for a surgeon to have personality, it is when doing an operation under local anesthesia with a patient who has come to the age of reason.

The mastoid cells are cleaned out as usual, the antrum opened, the curetting done, and that will suffice for a simple mastoid.

For a radical mastoid operation you may possibly have to inject some of the solution in the posterior part of the canal in the subcutaneous tissue. This is to assist in making the flap without too much pain. Your drumhead can now be removed and after placing in the middle ear, ten or twenty per cent cocain on cotton which will in a few minutes desensitize it for whatever work you desire to do there.

The operation is practically a bloodless one, and I saw it done in Vienna and assisted there with the operation, and doing them here myself, I feel that it can be made, with sufficient experience, a very painless operation.

The after treatment is the same as any other method of anesthesia.

Medical Arts Building.

A CASE OF MACROTIA, WITH OCCLUSION OF THE LEFT EXTERNAL AUDITORY CANAL; OPERATED WITH SATISFACTORY RESULTS.

Dr. William G. Shemeley, Philadelphia, Pa.

Macrotia, or large external ear, is frequently associated with polyotia. The exact causative factor is problematic. Casselo states the excessive development is usually confined to the auricle itself. He considers the opposite condition, or microtia, more frequent. Bacon considers that macrotia, microtia or polyotia is frequently found in conjunction with malformations of other organs.

Alexander, in his book, "Diseases of the Ear in Infancy and Childhood", refers to the fact that congenital appendages in the region of the auricle are not very rare especially in the parotid region and the auriclo-oral lines. Appendanges of the free parts of the ear are less common and are usually bilateral.

The case about to be reported is that of a young male, 9 years of age, who was referred for examination because of greatly diminished hearing in the left ear. The following are the findings at the time of his examination: Eyes, nose, mouth, throat and the right side of his face were normal.

Ears. *Functional Hearing Tests*: Right Ear, 8 m., Conv. Speech; 4 m., Whisp. Speech; 5 m., Akumeter. Left Ear, 25 cm., Conv. Speech; Whisp., not heard; Whisp. Speech, not heard.

Right Ear, Weber lateralized to the left, normal, Schwabach; positive 38 inches, Rinne'; normal, air. Left Ear, Weber lateralized, normal, Schwabach; not made, Rinne'; air, not heard.

Right Ear, normal, C64; normal, C2048. Left Ear, not heard; short 72″.

The fork used in making the above tests was a Reiner 256 D. V. weighted. Normal air 110″, normal bone 70″, Positive Rinne' 40″.

The right ear, externally, is larger than normal and shows the helix to be over developed. The position of the antihelix is nearer to the helix than normal. The fossa of the antihelix is poorly developed, as is the concha. Springing from the antitragus is a cartilagenous growth, 1 cm. high and of about the same diameter.

Otoscopic Examination, A. D.: Membrane intact, brilliant, translucent. Long process of the anvil is visible. Hammer handle in its

Read before the Philadelphia Laryngological Society, January 9, 1923.
*Accepted for publication in "The Laryngoscope". March 29, 1923.

normal position. Movements of the tympanic membrane with the Siegle otoscope and by Politzer inflation were normal.

Examination of the left cheek and ear revealed the presence of a cartilage-like tumor of the left cheek situated at about the midpoint of a line drawn from the angle of the left side of the mouth to the lobule of the left ear.

The growth was about 2 cms. in diameter. A cord-like structure resembling cartilage seemed to extend from the tumor towards the ear.

The left ear externally proved to be increased in size in all its parts. Protruding from the external auditory canal and apparently continuous with the tragus was an elongated cartilagenous projection 3 cms. long and from ½ to 1 cm. in diameter. The growth occluded the external auditory meatus. However, it was possible

to insert a very fine probe between the tumor and the posterior wall of the external auditory meatus. After careful consideration of the possibilities of malformation or imperfect development of the auditory canal itself—a point emphasized by Gruber and accepted by S. Moos and H. Steinbrugge of Heidelberg, and Professor Jaeger of Erlangen—operation was decided upon as the rational procedure.

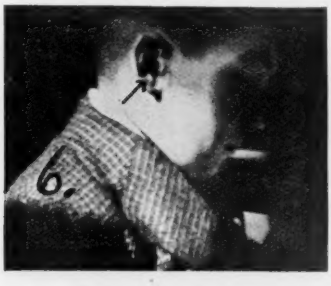
Operation: The patient was operated under ether narcosis. Skin preparation—Iodin 3 per cent followed by benzene and then followed by alcohol. The small elevation on the right antitragus was first infiltrated after the method of Schleich with a solution consisting of sterile water 30 cc. to which was added 5 minims of Adrenalin chlrodi solution (1-1,000). The skin was incised down the cartilage and by means of an elevator, such as is used in operations upon the nasal septum, the growth was freed from integument and cut off. The redundant tissue was trimmed and the incision closed with .00 chromic catgut stitches.

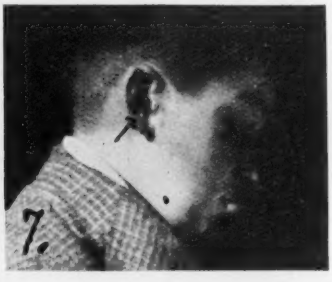
The wound was dressed in such a manner as to exert moderate pressure in order to attempt to control any slight oozing that might occur.

The field of operation on the left cheek and ear was prepared in the same manner as before. The skin over the growth on the left cheek was incised down to the firm structure beneath. The surrounding tissues separated easily. A tunnel-like projection of cartilage was found to extend toward the ear for a distance of about 2 cms. and to separate less easily.

The tumor was removed. The redundant tissue was excised and the skin closed with .00 chromic catgut stitches.

The skin of the projecting growth from the left ear was incised down to the place between the tumor and posterior wall of the canal, where it was possible to insert a very fine probe. Here the incision was carried forward to the region of the tragus and





backwards to the concha. The tumefaction was found to spring from the anterior and superior portions of the cartilagenous canal, within the external meatus. It was also continuous with the tragus. With a circular cut of the scalpel the growth was removed. It was then possible to insert an aural speculum and observe the details of the tympanic membrane. These were found to be the same as those of the right ear with the exception of an overfilling of the vessels along the hammerhandle, due no doubt, to the manipulation of the external canal during the operation. The skin wound was sutured with .00 chromic catgut and the canal firmly packed with plain, sterile gauze. Recovery was prompt and the wounds healed without infection. The photographs show that the cosmetic effect was fair, considering the degree of defirmity.

Functional hearing tests made two weeks after the operation showed:

Conv. Speech, right ear, 8 m.; left ear, 8 m. Whisp. Speech, right ear, 4 m.; left ear, 4 m. Akumeter, right ear, 5 m.; left ear, 4 m.

Weber not lateralized. Schwabach, right ear, normal; left ear, normal. Rinne, right ear, positive 40″; left ear, positive 35″. Air, right ear, normal; left ear, normal to 5″ short. C64, right ear, normal; left ear, normal to 8″ short. c2048, right ear, normal; left ear, normal.

Fork used in making the above tests is a Reiner 256 D. V., weighted fork; normal air 110″; normal bone 70″; positive Rinne, 40″.

After a lapse of three years there has been no tendency to cicatrical contraction of the left external auditory canal.

1724 Spruce St.

NEW INSTRUMENTS FOR PUNCTURING AND VISUALIZING THE MAXILLARY ANTRUM OF HIGHMORE.*

Dr. William Spielberg, New York.

Visualization of the maxillary antrum of Highmore for diagnosing diseases of the mucosa lining this sinus, has been attempted by rhinologists, some of whom have reported their work in literature.

Due, however, to the lack of a proper technique and suitable instruments, the majority have abandoned this method of examination and are relying chiefly on clinical data and X-ray findings for their diagnosis.

Following experimentation with several types of instruments at our clinic I succeeded in perfecting a technique and two instruments which make antroscopy or visualization of the maxillary antrum a very easy and simple procedure, operable in the hands of any one who may desire to do it.

The two instruments here presented are:

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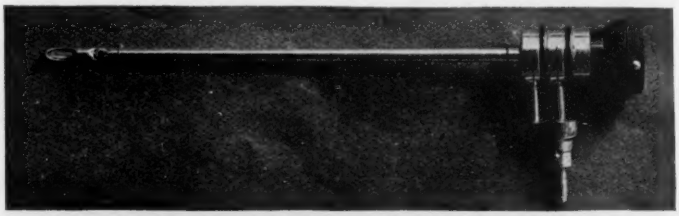
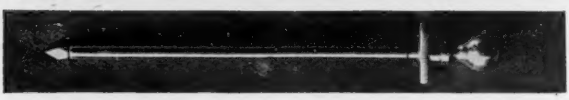
*From the Oto-Laryngological department of the Beth Israel Hospital, service of Dr. Samuel J. Kopetzky.
Presented before the Eastern Medical Society, March 10, 1922.
*Accepted for publication in "The Laryngoscope", May 25, 1923.

1. An antroscope or instrument with which to look into an antrum or sinus. (See Fig. 1.)

2. A trochar and cannula for puncturing the antrum. (See Fig. 2)

The Antroscope. In order to produce as little trauma as possible, it was necessary to make the instrument of the smallest possible diameter. The one here presented is 10½ on the French scale, or a diameter of 3½ mm. The smallest that has been made so far is 12½ French scale or a diameter of 4 mm. The length of the instrument is 105 mm. It gives a very clear, large angle of vision and considerable magnification up to one inch distance. The image is right-sided and upright, so that the object viewed is very easily interpreted. Achromatic lenses are used in the telescope. The weight of the instrument is one ounce. It is straight and uniform, keeping the same diameter in its entire length, including the lamp; a very important factor, especially when it is desired to pass the instrument through the cannula used for puncturing the antrum.





The Trochar and Cannula. The trochar and cannula are 90 mm. in length, with an inner diameter of the cannual of 3½ mm. They are straight and of uniform diameter in their length, permitting the antroscope to pass thorugh the cannula into the antrum, after the latter has been punctured. The cannula thus protects the lamp and lens from becoming soiled with blood or pus as the antroscope is being passed into the antrum.

Technique. The technique employed in antroscoping the maxillary sinus is as follows:

1. *Nasal Route.* The anterior one third of the inferior meatus is very tightly packed with one or two pieces of cotton impregnated

with cocain-adrenalin solution (equal parts of cocain 10 per cent and adrenalin 1.1000). The packing is removed after fifteen or twenty minutes. The trochar and cannula are then inserted into the inferior meatus, hugging the anterior border of the inferior turbinate at its junction with the outer nasal wall. Holding the instrument at an angle of about 30 degrees to the outer nasal wall, the latter is punctured at its anteriormost and highest part by applying moderate pressure with the palm of the right hand against the head of the trochar. If too much resistance is encountered, no force should be used, as a slight tap or two with a mallet applied at the head of the trochar will puncture the hardest bony wall.

After the antrum has been punctured, the trochar is withdrawn and the antroscope introduced through the cannula into the antrum and the latter inspected. If desired, the opening can be enlarged by a rocking to-and-fro motion of the trochar and cannula before the trochar is withdrawn. The antrum can be irrigated through the cannula.

2. *Canine Fossa Route.*[1] The mucosa overlying the canine fossa close to the bone of the anterior antral wall is injected with ½ per cent novocain solution. The lip is lifted out of the way with the index finger of the left hand and the trochar and cannula introduced into the antrum by applying pressure with the palm of the right hand against the head of the trochar, holding the sharp point of the trochar against the thinnest part of the canine fossa or anterior antral wall. On penetrating the wall, the trochar is withdrawn, the antroscope introduced through the cannula and the antrum ispected. A slight tap with a mallet applied at the head of the trochar will often facilitate this procedure.

1. BAUM, H. L.: Laryngoscope, Vol. XXXI, p. 965, December, 1921.

211 Henry Street.

IMMEDIATE AND LATE TREATMENT OF NASAL FRACTURES (ILLUSTRATED).*

DR. LEE COHEN, Baltimore.

In a former discussion (ref.) the widespread tendency of the general practitioner, who first sees most of these cases, to pass lightly over injuries of the external nose instead of providing immediate attention for such frequently occurring fractures, was deplored. There, too, a plea was made that the rhinologist endeavor to impress upon his general colleague the necessity of being able to recognize nasal fractures and give to them proper treatment, or to refer such patients, on sight, to some one qualified to do so. It is to be hoped that in due time a conscientious adoption of this principle will obviate the necessity of even referring to the subject of *late* management of fractures, and will also prevent the increasing number of deformities, internal and external, caused by early neglect of nasal fractures.

Recognition of fracture in reality presents little difficulty. Mere inspection often suffices, even without palpation and manipulation through which crepitus and undue mobility seal the diagnosis. X-ray examination, owing to the superficial position of the nasal bones, is to say the least superfluous, as fracture without displacement, so frequently reported by the roentgenologist, requires no surgical intervention.

Confronted with a case of fracture, should the nose immediately be set and placed in splint, or should we wait several days for disappearance of swelling? This is still a mooted question and often perplexing to those less experienced in the work. Although delay has been advocated by some of our best men, the idea it would seem is based upon the precedent long established in management of fractures in general rather than because of any difficulty which might follow immediate application of splint to a fractured nose.

Awaiting disappearance of swelling before applying permanent splint in fracture of long bones, which are all deeply placed in beds of muscular and connective tissue, through which course the nutrient vessels and nerves, is recognized as the proper surgical procedure. Here when plaster casts are applied early, the subsequent swelling may be so great as to cause constriction of blood vessels.

*Read before the Pacific Coast Ophthalmological Society, Los Angeles, Calif., June 23, 1923.

(Ref.). Management of Recent Fractures of Nose, Lee Cohen, Amn. Otol., Rhinol. & Laryngol., Sept., 1921.

*Accepted for publication in "The Laryngoscope", July 5, 1923.

sloughing and possible paralysis from pressure on the nerves. In case of the nose, on the other hand, the bones are very superficial, being covered practically only by skin and subcutaneous tissue to which the swelling is confined. Besides the face and head are so richly supplied with blood, that with any reasonable precaution, it would be most difficult to cause sloughing by application of a proper splint.

In the large number of nasal fractures for which we have cared the copper splint, lined with surgeon's lint, has been applied at once, and in no instance have we had reason to regret this course. The longer one waits after injury to apply splint, the more difficulty experienced in replacing the nasal bones and the bony septum.

A B

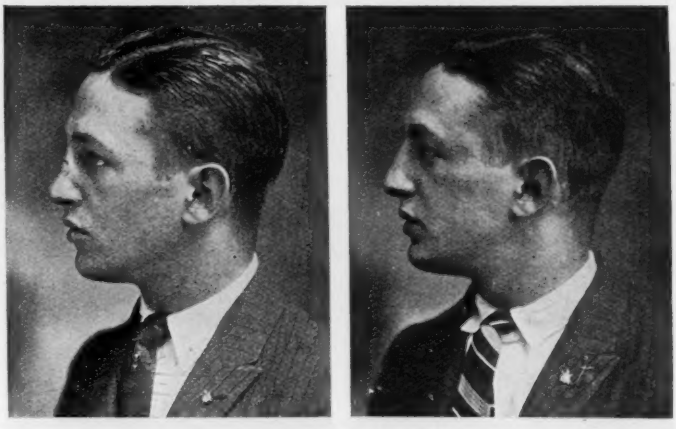
Case 1. (a) Twenty-four hours after injury.
Case 1. (b) Four weeks after correction.

Early setting of fractured nose is accomplished by the simple method of lifting the depressed fragments of nasal bones into place, setting the fractured bony septum in mid-line and retaining them by use of gauze packing within, along with a proper splint over the outside of nose. This applies especially when both nasal bones are thoroughly mobile through complete fracture.

Where the bone of one side is completely fractured along with the bony septum, and the fellow nasal bone only slightly cracked, as often occurs in young subjects, setting is not so simple. In such case the entire nose must be mobilized with Adams forceps, and possibly hammer, before setting in position.

Three cases have been selected from my records to illustrate first the management of fracture immediately following injury; second a month after injury, and one where the nose had twice been broken, four years having intervened between the two injuries.

Case 1. Male, 18 years. First seen late in afternoon May 6, 1923, four hours after being struck on right side of nose by baseball. Skin over nose ecchymotic with superficial abrasion, but required no sutures. Right nasal bone was comminuted and driven into the vestibule; the left was cracked at about its middle and driven outward, causing a hump on left side. The bony septum was also fractured and displaced toward the left.



C D

Case 1. (c) Profile twenty-four hours after injury.
Case 1. (d) Four weeks after correction.

The following morning photographs were taken, and after nose of the patient had been cleansed inside and outside, ether was administered, and post-nasal pack introduced, to prevent blood entering pharynx and larynx.

With elevator in right nares, no difficulty was experienced in lifting fragments of bone into proper alignment. Not so with the left nasal bone, however, nor could mobilization be satisfactorily accomplished by grasping bone with Adams forceps—one blade in nares and the other (covered with rubber tubing to protect skin) on outside of nose. A buffer, covered with rubber to protect skin, was placed upon the protrusion on left side and given several smart taps with hammer, thus sufficiently mobilizing the bone to permit easy replacement. Both vestibules were then packed with 1 half-

inch iodoform gauze tape, to support fragments from within, and the copper saddle splint placed over outside of nose.

First dressing on seventh day. Packing replaced for four days longer and then permanently removed. Splint worn four weeks, removing it every third or fourth day to care for skin.

Thus seen immediately after injury, correction in this case was made with comparative ease. Had *both* nasal bones been completely fractured the task would have been still simpler.

Case 2. G. F. C., age 27. State mounted police. Injured February 23, 1923, by falling from motor cycle travelling 50 miles per hour. Sent to local hospital for treatment, remaining several weeks. His X-ray failed to show fractured nose, he stated, but

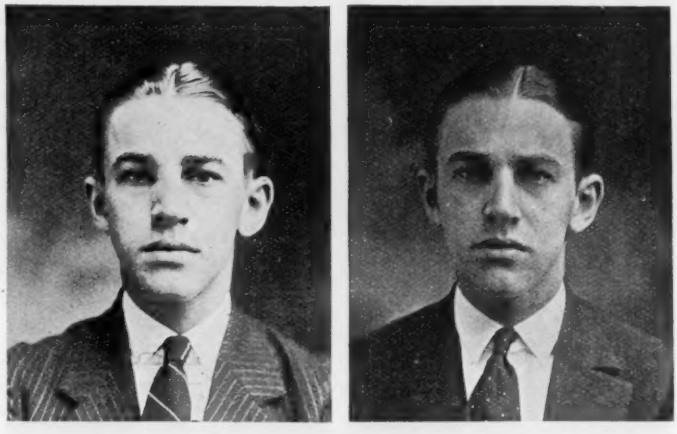
Case 2. (a) Fractured nose one month after injury.
Case 2. (b) Five weeks after correction.

did show fracture of body of right superior maxilla, this latter being confirmed by loss of inner half of right inferior orbital margin. Some weeks later the ridiculous statement was made to him by one of the physicians, that any attempt to correct the now existing nasal deformity would likely result in loss of sight of the right eye.

When first seen by us about a month after the injury, the deformity was marked. The lower half of right nasal bone had been driven inward, obstructing nasal breathing; the upper fragment stood out sharply beneath the skin like a blacksmith's offset. *Interior of nose*: Right side was not only obstructed by depressed nasal bone, but also by the displaced lower edge of a deflected

septal cartilage, so that patient complained mostly of inability to breathe, being less concerned as to the external deformity.

On March 28, 1923, under local anesthesia, through incision in right side of sub-septum, the lower edge of displaced triangular cartilage was removed to make for free breathing. Through this same incision the septal mucous membrane was undermined and a submucous resection performed, care being taken, however, to leave for support a strip of the triangular cartilage between orginal incision and the actually deflected portion of cartilage above. Wound in sub-septum sutured with black silk. Now, through incision in each wing, from within, where they join the edge of pyriform open-



Case 3. (a) Front view forty-eight hours second fracture. First fracture four years previously.
Case 3. (b) Front view six months after correction.

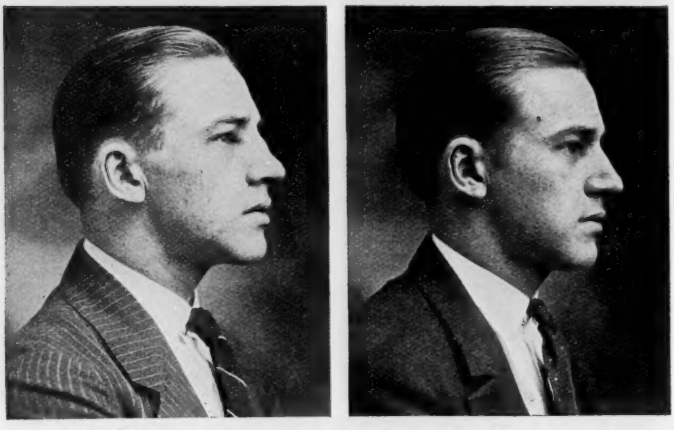
ing, skin over the entire dorsum was undermined. Through these incisions, by means of saw, Adams forceps and hammer, the entire bony nose was thoroughly mobilized, so that its constituent parts could be properly placed in alignment and the entire nose set in mid-line of face. Then after infracting both lower turbinates by use of turbinate compressor, to further improve nasal breathing, the vestibule was packing with 1 half-inch iodoform gauze tape, and the copper saddle splint applied in the usual way.

Healing took place uneventfully, with external results as herewith shown, and with comfortable nasal breathing.

This case illustrates the vastly greater amount of work required to obtain results than would have been the case if operated at once after injury. At that time no incisions would have been necessary

to replace the fractured nasal bones; also replacement of the septum could most likely have been accomplished without submucous resection or incision in sub-septum. And not the least important lesson to be had from this case is the safety from infection of so extensive an operative procedure in a nose so recently injured, when care is exercised in the preliminary aseptic preparation.

Case 3. L. F. G., male, age 20. Consulted us November 30, 1922. Four years previously nose struck by baseball, but received no attention at that time. External deformity resulted and breathing through right side was impaired. The night before coming to us, while in basket ball game, nose was again injured by blow from elbow of another player. At this time both nasal bones were frac-



Case 3. (c) Profile forty-eight hours after second fracture, showing depression at osseo-cartilaginous junction.
Case 3. (d) Profile six months after correction.

tured, the right one driven inward while the upper edge of the left one turned outward, presenting a sharp ridge along the dorsum. Viewed from the side, a definite depression existed at junction of osseo-cartilaginous portion. Internally there was a displacement of the septum to the right, causing marked impairment of breathing.

On December 1, under local anesthesia, through interior incisions, one in each wing at its attachment to the edge of the pyriform opening, skin over the entire dorsum was undermined. With Adams forceps, one blade in vestibule and the other passing through incision, each nasal bone was grasped, made thoroughly moveable and placed in proper alignment. The bony septum was likewise mobilized with Adams forceps, one blade on each side.

We also shortened the nose in this case by excising a V-shaped section of each wing cartilage, including lining, with knife and scissors. To determine size of section thus to be removed, the tip was lifted upward by the finger of an assistant to the desired heighth, causing the edges of the wing incisions to overlap. This overlapping segment was then excised. The sections so removed, after trimming off the lining to get rid of any glandular tissue, were placed beneath the skin of the dorsum to fill in the depression so evident in the profile picture.

After slinging tip well up with adhesive, so that the edges of wound in the alae came in contact, the vestibules were packed in the usual manner with iodoform tape, and the copper saddle splint applied. Patient remained in hospital four days. Just before leaving the splint was removed, and replaced after cleansing skin with alcohol. Interior packing changed on the seventh and permanently removed on the eleventh day.

Splint was worn for about four weeks, being removed every third or fourth day for treatment of skin, freshly lined each time and replaced.

Healing followed without complication, with excellent cosmetic result and good nasal breathing.

Conclusions: (1) Setting of fractured nose should follow as soon after injury as possible.

(2) Local anesthesia may be used in adults, except in presence of excessive swelling and infiltration of soft tissues, or when fracture is complicated by wounds of skin. In such instances infection would be more likely to follow injection of local anesthetic, and ether is therefore safer. For children ether is, of course, always employed.

(3) Wounds of skin, after thoroughly cleansing, may be sewed, and in no way contra-indicate the immediate application of splint, when patient is seen soon after accident, prior to any infection. Before applying splint in such instances, however, a fold of sterile handkerchief gauze of four or five layers, should be laid smoothly over the nose to protect wound, and after splint is in place, excess gauze removed by trimming along edge of splint.

(4) Due consideration to asepsis by the thorough cleansing of nose, internally as well as externally, as is done by us in all rhinoplastic work, eliminates danger of infection.

Some idea may perhaps be obtained from the short motion picture to follow as to the method of making and applying our splint. (Motion picture shown.)

1820 Eutaw Place.

FOREIGN BODY GRANULOMA OF THE NOSE.

DR. S. J. PEARLMAN AND DR. I. PILOT, Chicago.

Foreign bodies in the nose have long been mentioned in the literature. Baldewein[1] quoted Hippocrates who recommended the use of the nasal probe as an aid to diagnosis. The variety of foreign bodies encountered includes many animate and inanimate objects, such as peas, beans, bullets, buttons, and larvae. Children and the insane are particularly prone to insert strange objects into the nose. In adults cotton pledgets and gauze left by the surgeon are occasionally found. A great deal has been written on the diagnosis and treatment but little has been said of the changes in the tissues of the nose. It is the cellular reaction that we wish to emphasize in this report.

The clinical symptoms due to foreign bodies vary. Unilateral purulent and fetid discharge, epistaxis, excoriation of the upper lip, reflex phenomena such as conjunctivitis, earache and headache, have long been associated with foreign bodies in the nose. Large bodies give rise to obstructive symptoms; angular objects cause more irritation than the smooth. Absorbent materials as cotton and gauze, are more likely to become fetid, while peas and beans by sprouting, may attract attention to an otherwise unrecognized condition. For some bodies tolerance is established which may last for years and these be only accidentally discovered.

The surrounding nasal tissues may present changes varying from a chronic hyperemia of the mucous membrane to thickening with formation of granulation tissue and polyps. Necrosis and sequestration of the underlying bone may occur. Secondary infection of the accessory sinuses is not uncommon if the foreign body lies in the region of the middle meatus whereas the sinuses are usually not involved if the offending substance lies on the floor of the nose.

A few instances of polyps associated with foreign bodies have been reported. Heyman[2] mentioned an instance of a shoe button hidden by two gelatinous polyps in the nose of a child. He also confirmed Hopman's[3] observation of the formation of nasal polyps with foreign bodies. In 1699 J. C. Mueller[4] reported a case of nasal polyp due to a pea. In 1862 Job A. Meekren[5] described polyp formation from a splinter of wood. As no histological studies were

From the Emanuel Mandel Dispensary of the Michael Reese Hospital and the Department of Pathology and Bacteriology, University of Illinois, College of Medicine, Chicago.

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made the foreign body polyps were probably considered similar in structure to polyps associated with sinus disease, particularly suppurative and non-suppurative ethmoiditis.

The ordinary nasal polyps present a fairly constant histological picture. They are covered with several layers of cylindrical epithelium which is often ciliated. Secondary inflammation and pressure may destroy or convert the epithelium into the squamous type. Glandular tissue similar to that in the surrounding mucosa is often present. Obstruction of the glandular ducts may occur with cyst

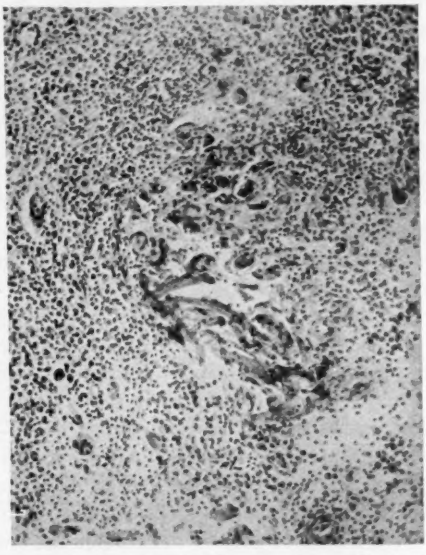

Fig. 1. In the center are strands of gauze about which are many foreign body giant cells. Numerous plasma cells occur throughout.

formation. The central stroma is composed of loose fibrous tissue often undergoing myxomatous change. Fibroblasts, round cells of various type, are common and eosinophiles are frequently and characteristically present.

Foreign body irritation leads to the formation of granulation tissue which may appear as polypoid growth. Histologically the reaction resembles that observed with foreign bodies in other tissues, with greater tendency to myxomatous changes in the nasal tissues. Suture materials, dirt, paraffin, and bismuth paste[6] cause tissue proliferation with the formation of fibroblastic elements, giant cells, and round cell infiltration. The giant cells, containing often enor-

mous numbers of nuclei, are characteristic and appear in greatest numbers near the foreign body. Such cells are not observed in the ordinary nasal polyp. The reaction with foreign bodies is like that of a granuloma and is not that of a true polyp.

Report of Case:

Mr. X, age 31 years, complained of right-sided nasal obstruction of two years' duration. At that time he had received a severe injury to the nose that necessitated a nasal operation. He had no other complaints, such as nasal discharge, anosmia or headache. On examination a brownish mass lying on the floor of the nose on the right side, easily removable, proved to be a piece of gauze 5 cm. long and 1 cm. in diameter. Two days later on re-examination a small, soft, pedunculated mass hanging from the middle of the inferior turbinate bone was readily removed with a snare. It was 1 cm. long, and 8 mm. in diameter, of red color, traversed through its interior by several strands of gauze. No pus was seen at any time. The region of the middle meatus and middle turbinate appeared normal.

Microscopic section (Fig. 1) revealed loose myxomatous tissue with dense areas of round cell infiltration, newly formed blood vessels and fibrous tissue, and strands of gauze about which were clustered numerous giant cells. The myxomatous areas were not unlike those observed in the ordinary polyp. Many fibroblasts were seen throughout. The round cells were predominantly plasma cells, with some polymorphonuclear leucocytes and lymphocytes. The gauze strands appeared cut in many directions and about these were seen many endothelial leucocytes and giant cells. The latter contained irregularly distributed nuclei 4 to 20 in number, with clear cytoplasm which often contained part of the foreign material. Numerous blood vessels presented thin walls. Many of the capillaries were newly formed with closed ends from which extended proliferating endothelium. The entire tissue was surrounded by epithelium made up of several layers of columnar cells, infiltrated with numerous polynuclear leucocytes.

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ON CERTAIN PHYSICAL AFFECTIONS OF THE NECK ENCOUNTERED IN DISEASES OF THE UPPER AIR PASSAGES.

DR. EDGAR F. CYRIAX, Edin., London.

During the last twenty-five years I have seen a number of cases in which various affections of the bones, joints, muscles and vessels of the neck were found together with ailments of the upper air passages which had not yielded to local treatment, and that treatment of the former was a very important factor—in some cases the only factor—in effecting amelioration. I therefore consider that a brief account of these neck conditions may prove of interest. I shall describe the following, all of which are fairly common:

1. Lordosis of the cervical vertebrae.
2. Persistent contraction of the cervical muscles.
3. Weakness of the cervical muscles.
4. General venous congestion of the neck.
5. Minor displacements of cervical vertebrae.
6. Alterations in the sensory functions of the nerves of the upper air passages.
7. Cervical adhesions.
8. Synovitis of the cervical joints.
9. Minor displacement backwards of the clavicle.

1. Lordosis of the cervical vertebrae. This may exist per se or be found in conjunction with upper dorsal kyphosis. The greater the degree of antero-posterior curve in the cervical vertebrae, the more will the internal jugular vein tend to become compressed between these bones and the sterno-mastoids, thus reproducing in the erect position of the head the state of affairs that obtains when the head is extended backwards. The result will be that this vein together with all the tributaries that empty into it at or above the site of compression will tend to suffer from chronic venous congestion. This may therefore be found in some of the veins of the naso-pharynx which open directly into the internal jugular vein, and in the superior laryngeal and crico-thyroid veins which also open into it either directly or through the medium of the lingual or linguo-facial trunk.

Apart from the above effects, such lordosis, if it be at all marked, may set up irritation of the larynx from direct pressure. Noehren[1] has even recorded a case in which extreme cervical lordosis caused

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death from asphyxia induced by direct pressure. And similarly, cervical lordosis may bring about irritation of the vagus nerves with possible resultant irritation in its two branches, the superior and inferior laryngeal, and may likewise involve the cervical sympathetic chain, and this may radiate into the laryngeal and pharyngeal branches that spring from it.[2]

2. Persistent contraction of the cervical muscles. This may be part of a general increase in muscle tonus from constitutional causes such as toxaemia, increased nervous tension, etc., or may be confined to the muscles of the neck from local rheumatism, fibrositis, joint trouble, etc., and may involve some or all of the muscles of the neck according to circumstances. Apart from the fact that such contraction may induce cervical lordosis, it may per se bring

Fig. 1. Friction on the posterior cervical nerve.

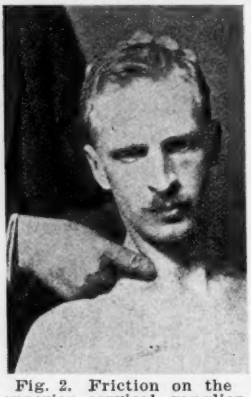

Fig. 2. Friction on the superior cervical ganglion.

about compression of blood vessels, both arterial and venous, and thus may produce varying degrees of anemia or venous congestion in the upper air passages.

Local contraction confined to the muscles of the upper air passages may be encountered. I have for example seen it, in cases of stammering, very markedly in the muscles that passed between the lower jaw and the hyoid bone. I have also seen it, in pharyngitis, in one or both sides of the space behind the angle of the jaw. In these cases it is very difficult to know whether the contractions are primary or secondary, just as it is equally difficult to decide this point in many cases of muscular contractions in the back in areas that correspond to diseased viscera. (The routine opinion in the latter cases is to consider them as being secondary, but this is often a great error.[3])

3. Weakness of the cervical muscles.[4] This may result from a variety of causes, the chief one being in my opinion that the human race as a whole so seldom uses these muscles against resistance in the manner in which this is done with the muscles of the trunk and extremities. The result of such weakness is that the muscles in question come to be in a continued state of overstrain. This may react on the posterior cervical nerves or the other nerves of the neck and may thus involve the upper air passages. In connection with this it is not impossible to suppose that if weakness results in the muscles that support the larynx and trachea against gravity, ptosis of these organs may result just as in the case of the abdominal viscera, and that this may lead to venous congestion, lack of nerve function, etc.

4. General venous congestion of the neck. This can, as already stated, arise from all of the above causes, as well as from inactivity

Fig. 3. Friction on the middle cervical ganglion.

Fig. 4. Friction on the inferior cervical ganglion.

of the neck and shoulder muscles, because such inactivity allows to fall into abeyance a certain mechanism by which the venous flow in the neck is promoted. About fifty years ago Braune[5] discovered that in most of the joints of the body, but specially at the hip, knee, shoulder and lower part of the neck, the veins are attached to fasciae, tendon sheaths, etc.; the latter are stretched in many movements and thus the veins are opened and a suction power is set up in them. When the fasciae, etc., are relaxed, the veins have their lumen diminished and their contents are sent onwards, the valves preventing any reflux. Soon afterwards Herzog[6] found that this mechanism also existed in the case of the internal jugular vein which is attached to the sterno-mastoid. If, as mentioned, this mechanism

is not working, a general venous congestion of the neck may ensue and this may produce its effect on the veins of the upper air passages.

5. Minor displacements of cervical vertebrae.[7] These are much commoner than is generally supposed, though they are rarer in professional singers than any other class of persons. They are specially liable to occur in the atlas and axis, where the most common type are malrotations whereby one lateral half of the bones project further into the naso-pharynx than the other, thus causing asymmetry of the vocal resonance chamber. I have published[8] a case which I saw in consultation with Sir Dundas Grant, in which a malrotation of the axis amounting to about 23°, with progressively decreasing amounts of malrotation in the four vertebrae below it, at first gave rise to the question of whether or not there was a bony tumor of the naso-pharynx; reposition was followed by an immediate improvement in voice production. Since seeing this case I have had a number of others similar to it.

Displacement forwards of the atlas as a whole is also fairly frequent, and slight in amount as this malposition must of necessity be (otherwise it would cause serious symptoms), it can be quite sufficient to cause changes in the reaonance chambers that may impair the voice production.

Apart from actual alterations in the size of the naso-pharynx, such malpositions may induce muscular contraction, lordosis, pressure on nerves and vessels, which may adversely affect the upper air passages.

6. Alterations in the sensory functions of the nerves of the upper air passages. The nerves that may be involved are the vagus, superior and inferior laryngeal, the sympathetic ganglia and the posterior cervical nerves. The alterations in sensation can be tested for by noting the sensory response to ordinary pressure, or to what is a much better method, namely a "nerve friction" according to the methods of the late Henrik Kellgren. I have described the actual technique of the latter manipulations on so many occasions[9] that it is unnecessary here to do more than say that a nerve friction is applied by drawing the tip of one or more fingers sharply across the structure in question thereby including a mechanical stimulation thereof.

The actual technique for nerve frictions on the vagus and posterior cervical nerves and the sympathetic ganglia has already been described by me in detail with illustrative photographs[10], it will therefore only be necessary for me to describe the method for the superior

and inferior laryngeal. As regards the former it is usual to treat the nerves of both sides simultaneously. The nail of the thumb and forefinger respectively are placed on either side in the space between the thyroid and hyoid cartilages and the frictions are applied from behind forwards and inwards. As regards the latter it is usual to treat only one nerve at a time; the tip of the forefinger is placed in the interval between the clavicular head of the sterno-mastoid and the trachea and is pressed backwards towards the vertebrae until it lies just behind the nerve; the frictions are then executed transversely in both directions.

The changes in sensation in the above nerves may be either an increase or a decrease, the latter being by far the commoner. When present it may be part of that clinical form of neurosis to which I gave the name of cerebro-spinal hypaesthesia,[11] in which there is general diminution of sensation, or it may exist per se. It is often very difficult to determine whether the nerve changes are primary or secondary to the conditions in the upper air passages; probably both can be the case. Just as with diminution of sensation elsewhere, so may diminution in these nerves lead to loss of tonus and various other disturbances from reduction of intensity in afferent stimuli from the organs in question. Clinically the return to normal of sensation is acompanied by improvement in the condition of the upper air passages that is associated with it.

7. Cervical adhesions. These are generally due to rheumatism, but may be due to inactivitiy, venous congestion, etc., as described above. They may cause weakening of the cervical muscles, either directly or else reflexly through joint involvement, and this may react on the upper air passages, as mentioned under 3 above.

8. Synovitis of the cervical joints. It must be remembered that synovial membranes exist between the occiput and atlas, atlas and axis, and in each intervertebral disk, and that such membranes can be affected by inflammation just as these structures can be affected in the extremities. The result will be weakness of muscles, congestion, etc., which may in consequence affect the upper air passages.

9. Minor displacement backwards of the clavicle. This is commoner than is generally supposed and is nearly always passed over for the simple reason that it is not looked for. It is however quite easy to identify when present, as it evinces itself by the fact that the healthy clavicle at its sternal end lies in a plane anterior to the one on the opposite side. The condition is nearly always unilateral; I have heard of its occurring bilaterally but have never had the op-

portunity of seeing this. The result as regards the air passages is that the sternal end of the affected clavicle is continually causing irritation of the trachea from pressure with resultant dry cough which does not yield to any treatment that does not include reposition of the bone.

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AN IMPROVED SEPTAL PUNCH FORCEPS.

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In the operation of submucous resection of the nasal septum it is highly desirable that the thickened cartilage and deviated bone between the middle turbinates are removed, first, to increase the space in this region and, second, to prevent post operative deviation as a result of tenting.

The instrument here described and shown in the illustrations is similar in mechanical principle and general design to Gruenwald's alligator type of nasal cutting forceps. It differs, however, from his and all other septal punch forceps in two important particulars, namely, it is larger, stronger, and altogether more substantially

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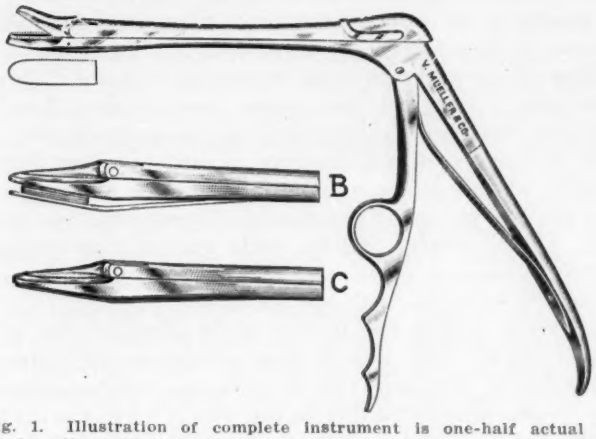
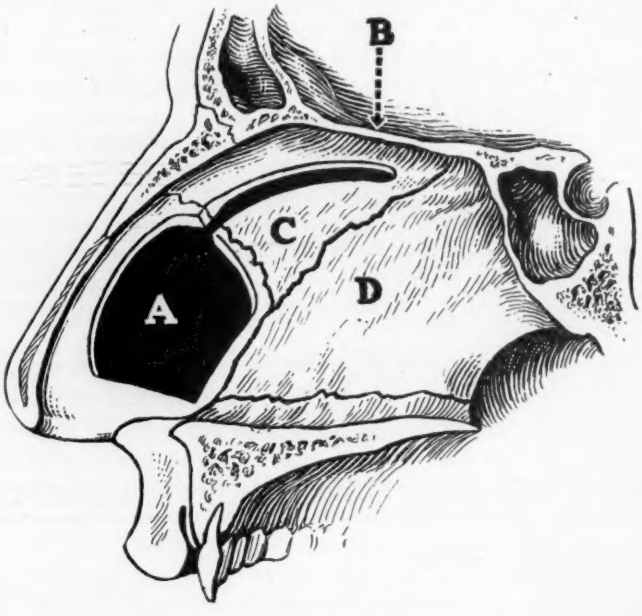


Fig. 1. Illustration of complete instrument is one-half actual size. Dotted outline indicates full size of bite; A, biting extremity (full size) closed; B, same, showing bone segments retained by the spring tongue.



constructed, and is provided with a spring tongue (A and B, Fig. 1), attached to the female portion of the bitting jaws, which serves to retain the bone segments after removal. (B, Fig. 1.)

When the perpendicular plate is removed with a forceps that necessitates breaking the bone, always there is some danger of fracturing the exceedingly light cribriform plate of the ethmoid. Reports of a number of such disastrous accidents have been reported by Loeb[1], whose statistics, compiled from replies to a questionnaire, show 120 fatalities caused by meningitis following intranasal operations. Of this number, thirteen deaths resulted from meningitis following submucous resection of the nasal septum, and five, after a combined submucous and sinus operation.

It is highly probable that fracture of the cribriform plate of the ethmoid was the direct cause of these unfortunate complications.

Technique of Application: In the submucous resection operation, after the mucoperichondrium of the two sides of the septum has been elevated, and the desired amount of the triangular cartilage of the columella is excised (A, Fig. 2), the forceps are then introduced between the flaps, and with two or three bites, a section is punched out of the superior portion of the perpendicular plate of the ethmoid (C, Fig. 2). It is now a simple, as well as safe procedure, to remove the remaining (inferior) portion of the perpendicular plate with any of the various septal forceps.

The advantages of this instrument may be summarized as follows: It occupies minimum space in the mucoperichondrial pocket; obviates the danger of tearing the flaps; affords an unobstructed view of the operative field; retains the bone segments after their removal; is so rigidly constructed that even the thickest and densest bone cannot resist its force; it accomplishes its purpose quickly, safely and efficiently by one introduction into the mucoperichondrial pocket.

The practicability of the instrument having been demonstrated in a large series of operations on the nasal septum, it is recommended with full confidence that it will serve the purpose for which it was designed.

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CARTILAGE AND BONE IN THE TONSIL.

DR. PHILIP HILLKOWITZ and DR. HARRY GAUSS, Denver.

Tumors of the tonsil are comparatively rare compared to the frequency of acute and chronic inflammatory processes of this tissue. Among the malignant tumors encountered are sarcoma, carcinoma, and lymphosarcoma with occasional cases of epithelioma and endothelioma. Benign tumors are found occasionally and isolated cases of most of the common varieties have been reported as lipoma, fibroma, papilloma, etc. In addition to these, certain other alterations are sometimes found in the tonsils, whose origin and pathological classification are uncertain; among these are the presence of bone and cartilage. The origin of certain types of bone found in the tonsil is almost self-evident, whereas the source of other types is unknown and, therefore, it becomes speculative. Several theories have been advanced to explain the origin of this type of tissue in the tonsil by various exponents and all of them have their supporters.

Orth, in 1893, is cited by Nosske as the first to report the occurrence of cartilage and bone in the tonsils. Orth explained their incidence as embryonic rests resulting from the second branchial arch. His pupil, Deichert, in 1895, reported cartilage in the tonsils of a two-year-old infant dying of diphtheria which he also explained as embryonic rests; however, another case of his is entirely different. In a thirty-five-year-old woman dying of miliary tuberculosis, the left styloid process was so long that it required cutting to remove the tonsil. Case reports of similar instances where the styloid process was apparently buried in the substance of the tonsil are recorded. Newcomb reports a case of a woman, age thirty, who complained of frequent attacks of sore throat, in whom tonsillectomy was advised and performed. Examination of the tonsil revealed the presence of a small tip of bone; and palpation of the tonsillar stump showed that this tip belonged to the styloid process. Stirling reports three cases of styloid process in the tonsils. Richards reports a case of a woman, age sixty, who had been suffering from pain in the throat for a period of two years and in whom he attempted tonsillectomy; however, when he applied the tonsillectome, he found that he was unable to cut through the tonsil. Digital examination of the tonsil revealed a bony mass penetrating the tonsil almost to its outer border. This was removed with bone forceps and was found to be a portion of the styloid process, the center of the bone showing district bone marrow. In the other tonsil the tip

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of the styloid process could also be felt through the tonsil. In a note appended to Richard's observation, Dwight comments that long styloids are not uncommon and that remarkably long ones are due to ossification of the styloid ligament which must pass very close to the tonsil on its way to the lesser horn of the hyoid; further, if a bony structure should enroach on the domain of adenoid tissue, the latter would enfold itself around it as it developed.

In contradistinction to the occurence of a single nodule of distinct bone with all the true characteristics, there have been described small islands of bone tissue in which more or less of the osseous elements are present. This is generally found concommittant with the occurrence of cartilage in the tonsil. Walsham observed two instances of bone and cartilage in the tonsils of patients dying from tuberculosis. The first case occurred in a man, aged fifty. The tonsils were removed post-mortem; they appeared atrophied. On microscopic examination the tonsillar crypts were few and wide, the squamous epithelium lining the crypts showed no alterations, many of the closed lymphatic follicles had disappeared; scattered through the organ at the base of the crypts were numerous small masses of bone in the form of trabeculae, rings and solid nodules. These nodules and trabeculae of bone did not encroach on the proper adenoid tissue of the organ. In one section a cartilaginous nodule could be seen. The second case occurred in a man twenty-seven years old, microscopic examination of whose tonsils revealed large masses of cartilage scattered through the adenoid tissue. In places the cartilage had been converted into bone. The matrix of the cartilage appeared in some places to be of hyaline variety, in others it appeared to be fibro-cartilage. Walsham believed these cartilaginous and bony nodules to be of foetal origin and regarded them as rests derived from the second branchial arch. Kanthock, to whom he showed the specimens, dissented from this view and regarded them as a metaplasia of fibrous tissue into bone or cartilage. Wingrave also reports the occurrence of cartilage and bone in the tonsil and he happily agrees with both the Walsham and Kanthock views as to their origin; he believes that the cartilaginous masses originate as developmental vestiges; however, the bony masses are probably metaplastic in origin.

Nosske reports six cases of cartilage and bone in the tonsils. In five of these the occurrence was in both tonsils, in the sixth it could be demonstrated only on one side. Four of these patients were men between the ages of thirty-seven and sixty, three of whom suffered from pulmonary tuberculosis and one had arteriosclerosis, the other two were women, aged fifty-one and seventy-six respectively, one

suffering from syphilis, the other from senility. Nosske observed the cartilage and bone in various parts of the tonsil, but mostly in the deeper layers of the connective tissue septa. He observed numerous transitions from connective tissue to cartilage or bone. Nowhere did the bone or cartilage display any tendency to leave the connective tissue. Nosske explains their occurrence on an inflammatory basis resulting from regressive changes occurring in tissue that is locally predisposed.

Lubarsch undertook to study the tonsils removed from bodies coming to autopsy. In this manner he studied the tonsils of four hundred and twelve consecutive post-mortems and found bone and cartilage in sixty-five instances or 15.7 per cent. Of those only five patients were under twenty years and the others ranged up to ninety-nine years, the largest number occurring in the fourth decade. The age incidence here rather argues against the congenital origin of the cartilage and bone, for if this were true they ought to occur in approximately the same ratio in the several decades if the number of examinations in each decade is the same; consequently, Lubarsch undertook the study of the tonsils in the foetuses, the new born and in very young children. He studied twelve cases divided as follows, four foetuses, varying from six to nine months, four new born from three to forty-eight hours old, and four infants of two and one-half, four, five, and seven and one-half months respectively. He found cartilage in the tonsils of one eight-month foetus and in one two and one half-month infant only. However, he cites Reitman who found cartilage in the tonsils of one foetus, in four new born and in two young infants. Lubarsch concludes that bone and cartilage in the tonsils are caused by a metaplasia of the connective tissue.

Ruchert found bone and cartilage in both tonsils removed from three adults and in one tonsil of a fourth adult. He undertook to study the tonsils of twenty-four new born and very young children. Out of the twenty-four he found cartilage in both tonsils of four, and in one tonsil only of nine; that is, in forty-eight tonsils examined, it was present in seventeen or 35.4 per cent. He concludes that the cause is embryonic rests from the second branchial cleft.

Halkin reports the occurrence of cartilage of embryonic type in a boy of sixteen, and bone and cartilage in the tonsils of a woman of fifty-one years who died following thyroidectomy. He objects to the idea of a metaplastic origin of these tissues. In one of his sections he found a small branchiogenic cyst which he argues demonstrates the relation of those tissues to the anomalous development from the second branchial cleft. He believes that the occurrence of

these extraneous tissue can be explained by Conheim's theory of the etiology of tumors.

Grove found cartilage in the sections of the tonsils removed from a youth of sixteen, also in the tonsils of a woman of twenty-three. The cartilage was of the hyaline variety and was situated in the connective tissue. The cartilage did not seem to have a definite capsule, however a gradual transition could be seen with the surrounding connective tissue. He regards this occurrence as a metaplasia although he doubts if true osseous tissue has ever been found in the tonsil.

The following eight cases were encountered while making routine pathological examinations of surgically removed tissue in the Mercy Hospital and St. Anthony's Hospital of Denver.

Case I. J. D., a male, age 26, complained of recurrent attacks of sore throat. Examinations showed both tonsils to be ragged and the crypts appeared to be filled with purulent detritus. Microscopic examination of the sections cut by the frozen method and stained with hematoxylin and eosin reveals generalized regressive and degenerative changes in the several component structures of the tonsils. The lymphoid tissue has a diffuse appearance and is not sharply differentiated into lymph follicles with germ centers. There is present considerable fatty degeneration in the lymphoid tissue. The capsule is thickened with a marked hyperplasia of the fibrous connective tissue. There are present large clusters of mucous glands apparently of the compound tubulo-alveolar variety, they are surrounded by sheaths of fibrous tissue some of which separate the large clusters into smaller bundles giving it a lobulated appearance; also some striated muscle fibers are immediately contiguous with the capsule. Several islands of cartilage are observed in the capsule. The largest one stretches across the low power microscopic field, which measures approximately 1.55 mm. They are all definitely limited to the capsule and show no contact with the lymphoid tissue. The cells of the fibrous tissue immediately in contact with some of island cartilage appear to be elongated and compressed simulating a sort of perichondrium. In other places there appears to be a gradual transition from the fibrous tissue cell to the cartilage cell. The cartilage appears to be of the white fibro-cartilage variety. The matrix of the cartilage is granular in appearance and takes an uneven light bluish pink stain. The nuclei of the cartilage cells stain deeply, they are centrally placed and are surrounded by a clear zone.

Case II. E. S., a female, age 53, a school teacher, complained of chronic sore throat over a period of several years with frequent

attacks of naso-pharyngeal catarrh sometimes accompanied by joint pains. Tonsillectomy was advised and performed. Microscopic examination of the tonsil shows a marked thickening of the capsule. The blood vessels in the capsule are dilated and engorged, also there are present a few small hemorrhages. Mucous glands and striated muscle fibers are present in capsule tissue. The lymphoid tissue contains some fatty degeneration, and has a diffuse appearance with the follicular and germ center markings partly obliterated. Some of the connective tissue appears to have undergone hyaline degeneration. There are no crypts seen and the mucous membrane is atrophied. There are present several areas of cartilage confined to the capsule. The largest one stretches across the low power microscopic

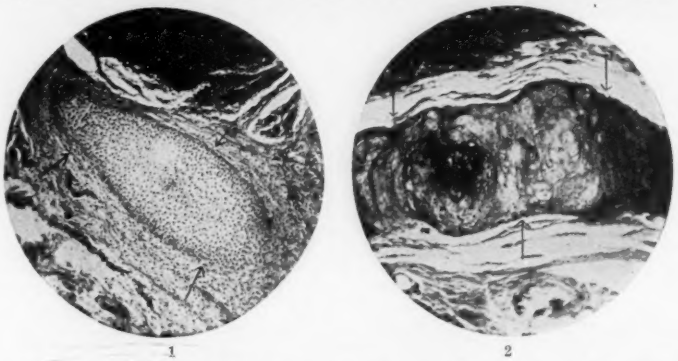

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Fig. 1. Photomicrograph low power illustrating the occurrence of an island of hyaline cartilage in the fibrous tissue capsule of the tonsil. At the end of the long axis of this island the transition into the adjacent fibrous tissue is apparent. (We are indebted to Dr. H. J. Corper for the courtesy of the photomicrographs.)

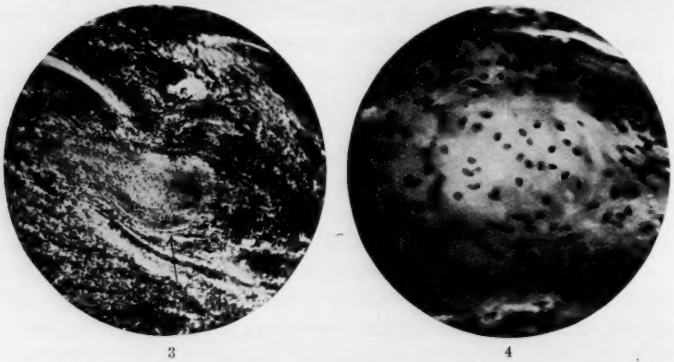
Fig. 2. Photomicrograph low power illustrating the occurrence of white fibro cartilage in the fibrous tissue septa of the tonsil. The dark area near the middle is an ossification center in which the osseous elements have appeared showing the transition from cartilage to bone.

field. The cartilage appears to be of the white fibro-cartilage variety. The islands are surrounded by bands of fibrous connective tissue which is sharply differentiated from the cartilage.

Case III. M. H., a school girl, age twelve, complained of protracted attacks of hoarseness, rhinitis and sore throat. A tonsillectomy had been performed ten years previous, nevertheless examination showed the tonsils to be hypertrophied. Tonsillectomy was advised and performed. Microscopic examination of the tonsils showed a loss of the follicular differentiation of the lymphoid tissue which has a diffuse appearance, the mucous membrane is irregular in its appearance. The capsule is considerably thickened, some of the fibrous tissue has undergone hyaline degeneration, there is present foci

of chronic inflammatory infiltration in the capsule. There are present in the capsule several islands of cartilage. These are generally elliptical or oval in shape, the largest one is approximately 1.7 mm. in its greatest diameter. It is of the white fibro-cartilage variety. The islands of cartilage are all definitely confined to the fibrous tissue.

Case IV. D. C., a female, age 23, a student, complained of frequent attacks of sore throat with hoarseness. Examination showed the tonsils to be enlarged. Tonsillectomy was advised and performed. Microscopic examination of the tonsils showed the capsule to be thickened and containing an increased amount of fibrous tissue, in places it is contiguous with bundles of striated muscle fibers.



3 4

Fig. 3. Photomicrograph low power showing a whorl formation of fibrous tissue in the capsule. In the center, cartilage cells have appeared.
Fig. 4. Photomicrograph high power taken of the whorl formation shown in photomicrograph 3, showing the cartilage cells and the transition into the adjacent connective tissue. This is a very early center of cartilage formation.

The blood vessels are dilated and engorged, some small hemorrhages are present into the fibrous tissue. The lymphoid tissue shows the usual separation into follicles by septa of fibrous tissue and the germ centers of the follicles are distinct. In the capsule are seen several islands of cartilage, the largest one of which measures about 0.9 mm. These are oval, round and irregular in shape. The cartilage passes by gradual transition into the adjacent fibrous tissue. The cartilage appears to be of the hyalin variety.

Case V. C. P., age 29, a female, working as a mattress maker had a chronic sore throat for a year or more. Examination showed hypertrophy of the tonsils. Tonsillectomy was advised and performed. Microscopic examination shows extensive degeneration and chronic inflammatory reaction of the several component parts of the tonsil. The mucous membrane is irregular in appearance and

shows regional edema both intracellular and intercellar. In places the mucous membrane is greatly thickened and contains whorls resembling epithelial pearls, also, there are present foci of lymphoid infiltration. In other places it dips down into the lymphoid tissue and has become occluded forming solid plugs of epithelium. The lymphoid tissue is divided into the usual follicles and germ centers, but some of these are irregular in outline and appear distorted. Some of the lymphoid tissue has undergone fatty degeneration. The capsule is thickened and contains areas of striated muscle fibers, also foci of lymphoid infiltration, some loose areolar tissue and some small hemorrhages and islands of bone and cartilage. These latter vary in size. The smaller islands are about the size of a

5

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Fig. 5. Photomicrograph low power illustrating the occurrence of an independent ossification center in the fibrous tissue of the tonsil. The lacunae may be seen imbedded in a clear matrix surrounded by a denser matrix taking on intense eosin stain which appears black in the photograph.

Fig. 6. Photomicrograph low power illustrating an independent area of bone growing in the fibrous tissue of the capsule. Calcification has appeared in this area.

small capillary and the larger ones stretch across two low power microscopic fields approximately 3.1 mm. The cartilage is of both the hyalin and white fibro-cartilage variety. The small islands are round in shape and are arranged in whorls. The larger islands are round, oval and elliptical. Most of these islands pass by very gradual transition into the surrounding fibrous tissue and in some of the smaller islands the zone immediately in contact with the cartilage contain cells having the characteristics of both the fibrous tissue cell and the cartilage cell, also in other places the cartilage passes by transition into osseous tissue. The osseous tissue occurs both in contiguity with the cartilage and as independent islands in the fibrous tissue. It shows various stages of development. Some of the larger islands appear as prominent areas taking on intense eosin

stain and having a hazy or cloudy appearance under the low power lense; however, under the higher magnification this can be differentiated quite definitely into Haversian canals surrounded by concentric lamellae. In some of the Haversian canals there are found blood vessels. In some of the smaller islands the lacunae and canaiculi can be recognized lying in a clear matrix surrounded by a zone taking the intense eosin stain and this in turn is surrounded by transitional connective tissue. The bone and cartilage is confined to the connective tissue stroma. It does not come directly in contact with the lymphoid tissue.

Case VI. M. W., female, age 45, complained of repeated attacks of sore throat and pains in the muscles of the neck. Examination showed the tonsils to be enlarged and infected; also the cervical glands were enlarged. Tonsillectomy was advised and performed. Microscopic examination of the tonsil shows marked degeneration and chronic inflammatory alteration in the several component parts of the tonsil. The mucous membrane is irregular in its thickness and in places it appears to be smaller and desquamating, in other places it is eroded and replaced by cellular debris. Some of the crypts are filled with debris and others have become occluded and are present as solid plugs of epithelium. Many of the lymphoid follicles have lost their characteristic markings and are seen as diffuse masses of lymph cells. The fibrous tissue shows a marked hyperplasia, and both the white fibrous tissue and the loose areolar tissue are increased in amount. In the substance of the capsule are found bundles of striated muscle fibers. There are present in parts of the capsule whorls of fibrous tissue suggestive of the pearl formation, in these all the cells are fibrous tissue, in others, however, cartilage cells can be seen in the centre with the outer cells retaining the characteristics of the fibrous tissue cell. There are present various sized islands of cartilage and bone from small whorl formations about the size of a small blood vessel to others which cover the greater part of the low power microscopic field. Frequently the bone and cartilage occur together and appear to pass from one to the other by direct transition. However, small islands of bone tissue also are seen independent of the cartilage. In the smaller islands of bone the lacunae and canaliculi can be observed.

Case VII. H. H., a boy of ten years, had recurrent attacks of tonsilitis for the past three years, he breathes through his mouth and presents the so-called adenoid facies with a pinched nose and high arched vault of the mouth. The tonsils are enlarged. Tonsillectomy was advised and performed. Microscopic examination of the tonsil shows a marked hyperplasia of the lymphoid tissue; the

follicles are well marked and the germ centers are distinct. The mucous membrane shows some chronic inflammatory changes including localized swelling and intracellular edema; in places it is eroded and replaced by a chronic inflammatory infiltration. Some deep crypts are present which are filled with cellular debris. In the capsule are seen several areas of hyalin cartilage, the largest one measures about 0.8 mm. in its greatest diameter. The cartilage cells pass into the connective tissue surrounding it by transitional stages. The matrix of this cartilage is homogeneous and almost transparent, it takes a very pale reddish blue stain. The nuclei of the cartilage cells take a deep blue stain, but the remainder of the cell is clear and almost transparent.

Case VII. F. M., a female school teacher, age 24, complained of recurrent attacks of tonsillitis and sore throat. Tonsillectomoy was advised and performed. Microscopic examination of the tonsils shows marked chronic inflammatory changes in the several component parts of the tonsil. The mucous membrane is irregular and appears to be desquamated in places; in other places it is eroded and replaced by an inflammatory infiltration. Several crypts are seen to be present with enlargments at the base and containing masses of cellular debris. In small areas the mucous membrane shows a distinct tendency toward cornification and appears to be covered by a horny layer. The lymphoid tissue is present as a diffuse mass of cells and contains very little of the follicular markings. The fibrous tissue shows considerable thickening, the blood vessels are engorged. There are present small foci of inflammatory infiltration also numerous various sized areas of bone and cartilage. The cartilage is usually of the white fibro-cartilage variety.

Summary. The occurence of bone in the tonsil may sometimes be caused by an abnormally long styloid process encroaching into the domain of the anatomical site of the tonsil and so becomes surrounded by the lymphoid tissue in the process of the natural growth of the tonsil.

Multiple small islands of bone and cartilage occurring in the tonsil have been reported and the origin of these is not determined.

We have reported eight such cases encountered in routine pathological examination of surgically removed tissue in all of whom cartilage was found and in three of whom islands of bone were found.

In the latter type of bone occurrence generally associated with cartilage occurrence, three main theories have been put forth to explain their origin. First the theory that they are the vestigial remnants of the second branchial arch, second that they result from the

development of misplaced embryonic rests, third that they result from a metaplasia of the fibrous tissue.

In support of the theory that this type of bone and cartilage are the remains of the second branchial arch, it has been pointed out that other evidence has been found of the simultaneous occurrence of branchial remnants such as the branchiogenic cyst reported by Halkin; further that bone or cartilage have been found in tonsils which were otherwise normal and finally that they have been found in all ages.

In support of the theory that they result from embryonic rests, it has been pointed out that these tissues have been found in embryoes and in the new born, that the cartilage may be of the embryonic type, that the embryonic rest theory is one of the general theories put forth to explain the development of tumors and it has found many supporters; also, this theory has nothing improbable in itself. self.

In support of the theory that these tissues result from a metaplastic metamorphosis of the pre-existing fibrous tissue, it has been pointed out that the greatest majority of instances of the occurrence of these tissues have been in the tonsils which were the site of a chronic inflammatory process associated with degenerative changes; further the age incidence, as pointed out by Lubarsch, indicates that the greatest number of cases occur after the body growth is ordinarily regarded as being completed and that the fourth decade of life has the greatest incidence; further examination of the islands of cartilage and bone reveals, according to most writers on this subject, that these tissues do not possess a true limiting membrane such as a true perichondrium or a true periosteum. rather these islands of bone and cartilage can be observed to pass by transition from one into the other and from both into the adjacent fibrous connective tissue, further the islands of cartilage practically always occur in the connective tissue of the tonsil and it is doubtful if they have ever been observed growing out of the lymphoid tissue.

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SPOROTRICHOSIS OF THE NOSE.

Dr. Geo. C. Albright, Iowa City, Ia.

Sporotrichosis is a comparatively newly recognized disease, the first case being that described by Schenck,[1] of John Hopkins in 1898. It seems to have attracted but little attention, however, until De Beurmann[2] in 1912 described the condition more in detail, both clinically and from a labratory standpoint and collected approximately two hundred cases from the literature of the world. Not all of these cases were diagnosed culturally. In the same year Ruediger[3] collected all the cases he could find in literature and private reports in the United States, a total of fifty-seven cases. Out of these only twenty-four were diagnosed culturally. Since that time isolated reports are found in the literature, one or more a year. A later statement by McClean[4] is to the effect that the total number of American cases is probably less than one hundred. Sutton[5] considers the condition so rare that he advocates all cases being reported until the symptomatology and pathology are fairly well established.

At present many cases are undoubtedly overlooked. It is also probable that many cases are wrongly diagnosed, although it would be hardly fair to demand that all cases be diagnosed culturally before being accepted as cases of true Sporotrichosis.

Etiology: Sporotrichosis is caused by a fungus, the Sporothrix. The tendency of the European authors is to have a great many cultural divisions of the Sporothrix, while the American authors seem to regard it as the same fungus throughout, the different cultural characteristics being dependent upon local conditions. The Sporothrix, as described by Schenck and the one described by De Beurmann, do vary, but cultures, regarded as definitely individual, after prolonged culture become identical.

Geographical distribution in the United States: It is interesting to note that, while cases have been reported from the farthest east to the west, Reudiger[3] points out that five-sixths of all the cases reported up to 1910 had occurred in the Missouri Valley. At that time only one case had been reported from Iowa while twenty-three were reported from North Dakota and twelve from Kansas. No explanation is offered for this peculiar distribution.

Parts Affected: By far the greater percentage of cases affect the

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skin and the sub-cutaneous tissues, particularly the lymphatic system. The skin and the lymphatics of the extremities, particularly the hands and arms are most frequently affected. Cases are reported though, of joint[6], pulmonary[7], genital[8] and buccal[9] involvement.

Of interest to those engaged in the head specialties are cases of Sporotrichosis of the eye and eye-lids[10], of the ear[4] and of the frontals[11] which have been reported. So far as I have been able to learn, no nasal Sporotrichosis has been reported although other parts of the respiratory passages, as above mentioned, are affected.

Lesions: The usual cutaneous manifestations of Sporotrichosis are those of indolent, nodular, indurations usually painless, gradually going on to breaking down and suppuration. The lesions usually spread along the course of lymphatics, as for example, up the forearm, arm and axilla. They are usually resistant to treatment. The general health of the patient is usually good, only a little fever results, and little or no leucocytosis. If, however, there is a secondary invader, the lesions may be varied in appearance and may be very painful. Pyrexia and a moderate increase of leucocytes may supervene.

The case which I wish to report is a little peculiar in that the lesions were always painful, also in that there was only a little tendency to ulceration. The lesions were regarded by a number of excellent men as ordinary boils. He always had systemic disturbances whenever a fresh crop of boils would appear. The history of the case is as follows:

Mr. F., miller, consulted me December 8, 1918, for recurrent "boils" in his nose, located, as he expressed it, right on the inside at the tip. These "boils" had been troubling him at intervals for two or three years. They had never confined themselves entirely to the nose but had been in various places on the body, particularly where the clothing rubbed, for example, at the wrists and neck. They seemed more frequent around the neck and beneath the mandible. On the body, he stated, many of the "boils" acted as ordinary boils, coming to a head, when they could be opened, pus evacuated and, after a rather long period, they would heal up. Others, however, would start with redness and soreness and then apparently dry up, leaving sub-cutaneous nodules but without any ulceration. One thing of which he complained very much was the intense soreness of the lesions in proportion to their size. His occupation kept him continually in the dust, particularly of grain. The lesions, however, he had observed, had not developed until he had moved to a new location, an old elevator, in which grain had form-

erly been stored. One of the first tasks he had was to clean out a number of these old moldy bins.

The nose was very sore. There was no discharge to speak of. At times he said his throat was sore, but not so sore as the nose. He was troubled a good deal with pus around the roots of his teeth which his dentist told him was not true pyorrhea. The past year, he had been troubled a great deal with headaches, worse in the morning but continuous during the day. His general health was good. He had consulted a number of physicians concerning the boils and had tried various medicinal agents. One physician had made and administered an autogenous vaccine. Nothing, however, had seemed to be of any permanent value.

On account of his occupation and because of the history, that some of the nodes would start and then apparently dry up, I suspected a blastomycotic infection, although the ulcers were never multiple as is common in that infection.

Examination showed two or three small furuncles in the right anterior naris in between the vibrissae. An attempt was made to open one of the furuncles and secure some pus but was unable to do so on account of the patient's inability to stand pain. So palliative treatment was prescribed and patient told to keep out of the dust, apply local applications to the naris and return in one week. Upon his return the nose was better but he had a large boil on his wrist. A good quantity of pus was secured from this, sent to the pathologist, with the request that blastomycosis be looked for. The initial report was that, "Blastomycosis is suspected. Send more material." Five days later he returned with two new boils, one on his neck and one in the right anterior naris. Pus was now secured from the boil in the anterior naris, from the neck and I accompanied him to the dentist where we secured a large amount of pus from around the roots of both upper and lower teeth. A culture was taken also from the throat. This material was all sent to the pathologist for an examination.

The work of identifying the fungus from all the lesions required numerous laboratory proceedures and in all took about five months time, the final report being dated May 19, 1919. The laboratory work was very kindly carried out by Dr. Henrietta Calhoun, of the Department of Pathology and Bacteriology of the State University of Iowa, College of Medicine. I wish to express my appreciation of her pains taking, careful work in isolating and identifying the fungus.

Her report will be given verbatim.

Before the cultural characteristics could be fully determined, we secured on January 3, 1919, some fresh pus from a large boil on the back of his neck. This we placed immediately in 10 per cent potassium hydroxide and examined it microscopically. This examination excluded blastomycosis since there were no highly refractile bodies with a double contour, typical of that fungus, but there was a fine almost unbranched mycelium which suggested the Sporothrix. Numerous staphylococci were present. This secondary infection probably explains why the lesions were so painful.

As soon as the sporothrix was suspected as the cause of his lesions the patient was put on large doses of potassium iodide. In February, 1919, owing to his lack of tolerance of potassium iodide, he asked that we try a preparation of an autogenous vaccine. After consultation with Dr. Henry Albert, Head of the Department of Bacteriology and Immunology, this was done. By the time this was completed and the doses graduated, and three initial small doses administered, he became more tolerant of the iodides. The lesions also had begun to subside to such an extent that the vaccine was discontinued. In March he consented to our advice to have the abscessed teeth all extracted. Following this the gums healed in the usual time.

As above noted the work of identifying the fungus required five months time. It should be noted in reading the laboratory report that the Sporothrix was secured from every solitary lesion, nose, teeth, boils in the various locations, prior to May, 1919.

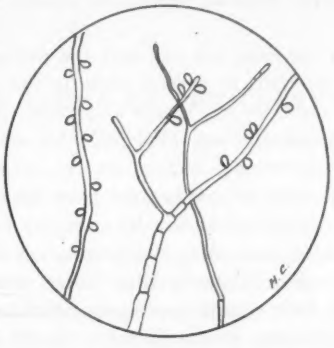
Dr. Calhoun's Report on Cultures from case of Mr. F.:

"The first cultures received on December 26, 1918, show a slowly growing organism that develops best at room temperature; cultures on glucose agar and serum media showing a deep orange wrinkled growth in 10 days. Smears made from these cultures show some typical gram positive staphylococci associated with coccoid organisms occurring in clumps and in small chains which vary in diameter from 1 to 1½ micra and which do not stain uniformly either with gram or with methylene blue. The development of a filmy white growth between the medium and the wall of the tube suggested the presence of an anaerobe, so cultures were made under sterile mineral oil on dextrose serum water, plain broth, glucose broth, blood agar, and plain agar. In 12 days there was a white mycelium growing up into the oil in all the tubes except the plain broth and the plain agar. Mycelial growth was most abundant in the dextrose serum water where the serum water was coagulated and acid was formed. Mycelium under the oil immersion objective

showed a branching mold, segmented with ovoid or round bodies attached singly or in groups of 2 or 3 along the hyphae. Fig. I. Cultures made from this mycelium grew as an orange yellow growth at room temperature under aerobic conditions showing the round bodies noted in the original smears, but no mycelium. Cultures made on sterile strips of straw board under oil gave an abundant mycelial growth. Repeated cultures from the lesions on the neck, nose, gums and face, gave the same organism, associated with staphylococcus albus and aureus.

"Cultures made in the fall of 1919 from a lesion on the hip gave only staphylococcus aureus and no trace of any mycelial growth could be found.

"The organisms present was probably one of the many pleomorphic forms of Sporotrix Beurmanii. It differs quite markedly from



those previously reported in producing the mycelium only under anaerobic conditions. The use of sterile mineral oil as a means of growing anaerobic mycelial organisms is especially to be recommended.

"That the sporothrix found was pathogenic for man was substantiated by the occurrence of an infection in one of the labratory staff. In January and early February, 1919, the cultures were turned over to X to have an autogenous vaccine made. Two weeks later, X noted a small very painful indurated lesion in the nose. This became pustular and cultures from the pus gave, under anaerobic conditions, the same mycelial growth, and under aerobic culture, the coccoid organisms varying in size and in intensity of staining. X was put on intensive iodide potassium treatment by mouth. There was a series of four recurrences, extending over a period from the end of February to the last of April, 1919. Potassium iodide was

continued until the middle of May. In the two years following, there have been no recurrences."

From May until November, 1919, the patient, Mr. F., was put on increasing doses of potassium iodide. Some little difficulty was experienced in the use of the drug but we gradually reached 75 grains daily. During the time from May until November, there were no lesions but at times some iodide rash. November 8 three lesions developed simultaneously, one on the right hip, one on the right hand, one on the neck. Pus was obtained from these and sent to the pathologist who two weeks later reported pure culture of staphylococcus albus. No mycelia could be found. The iodides were continued for about another month when they were stopped and the patient put upon Fowler's solution for one month. By this time his general health had improved and all treatment was discontinued. In April, 1923 he reports no lesions since November, 1919.

In summing up the case, we find that the patient had lesions in the nose, around the roots of several teeth, in the subcutaneous tissues of the face, neck, wrists, thighs and back, from all of which the Sporothrix Beurmanii was obtained. In nearly all of these lesions, the Staphylococcus infection was co-existant. One must regard the case as rather unique because most Sporothrix infections can be traced to an initial lesion, usually an injury from which initial lesion the infection spreads along the lymphatics, developing at the site of the lymph nodes. The wide distribution of the lesions in the case together with their erratic appearance would certainly suggest that the original infection was to be found in the mouth. Though we have no evidence that Sporothrix could be blood-borne or lymph-borne from the digestive tract, it is hard to explain on any other hypothesis the appearance of the lesions in parts so remote from the open sites. The infection certainly was not confined to any particular chain of lymphatics. Eisenstaedt[12] considers that the infection may be hematogenous when the initial lesion is a cutaneous one.

The prolonged administration of iodides, the best accepted treatment for Sporotrichosis, eliminated the fungus from the system. After its elimination the three Staphylococcic boils developed but nature was able to overcome this infection without difficulty. It is also of peculiar interest to note the development of the Sporothrix infection in one of the laboratory staff who was interested in tracing out and identifying the organism.

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PROGRESSIVE EDEMA OF THE LARYNX, SPECIFIC.*

DR. HARMON SMITH, New York.

D. A.—Age 48.

Patient was referred to me by Dr. Howard from the Cornell Clinic, April 19, 1923, with the following history:

Six or seven weeks previously had become hoarse with increased shortness of breath and a choking sensation in the larynx. One child living and no miscarriages. Complained of no pain whatever during the entire time of her disturbance either local or in the ear. No cough previous to the beginning of the hoarseness and since then only a silght, hacking, discomforting cough. No history of tuberculosis, cancer or syphilis in the family. Complained of some difficulty in sleeping owing to the choking sensation. Had no difficulty in swallowing food.

Examination revealed considerable dry, scabby atrophic secretions in the nose and some atrophic pharyngitis. On examination of the larynx found the right arytenoid, part of the inter-arytenoid space and the ary-epiglottic fold on the right side presenting a typical pyriform edema with a very much congested and reddened base. The part of the right true cord which was observable was slightly reddened and restricted in its movements. The left side was uninvolved. The voice seemed influenced only by the supra-

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imposed edema. On palpation with the finger, the mass was very hard and did not bear out the impression gleaned from observation in the mirror.

Dr. Howard in turning the case over to me vouchsafed the opinion that there was an abscess beneath the edematous condition and was on the point of puncturing the same at the Cornell Clinic, but having no hospital facilities and feeling that the trauma might cause further edema, he asked me to place the patient in the Manhattan Eye, Ear and Throat Hospital.

The patient appeared at my clinic the following day at which time under local anesthesia I punctured deeply into the apex of the edematous mass. On entrance met with a hard, resisting, tumerous mass. I advised a Wassermann be made immediately, the report of which, however, was not returned until some days thereafter, not, in fact, until Dr. Monroe, my Chief of Clinic, made a second puncture, feeling that there must be pus somewhere beneath the edema. In view of the absence of pain and temperature, I offered as an opinion that I believed the condition to be syphilitic and that it was due to an attempt on the part of nature to extrude an involved arytenoid cartilage. I was not sustained in this opinion and a direct examination was advised which was made by Drs. Imperatori and Knopf with an esophageal speculum, by which a hard, indurated mass surrounded by edema was found extending behind the larynx and down into the esophagus as far as the crico-pharyngeus.

Immediately after this examination the delayed Wassermann was returned which showed 4+. The patient has received since that time four doses of neo salvarsan with mercury and K. I., on April 26, May 2, 9, and 16. With each dose the tumefaction has materially disappeared until now there is but slight evidence of involvement.

This case demonstrates the ease with which improper diagnoses can be made and likewise how essential it is to arrive at a definite conclusion by the exclusive method rather than by reliance on one's vision. While it is sometimes necessary to puncture in these cases of syphilitic periostitis or when an effort on the part of nature is made to throw off dead bone or cartilage, nevertheless the same condition will in the majority of instances respond to anti-syphilitic treatment without operative interference.

RADIUM IN THE TREATMENT OF MALIGNANT TUMORS OF THE NOSE AND THROAT.

Dr. John R. Ranson, Denver.

Malignant tumors of the nose and throat have proved to be the most difficult types of malignant diseases with which to deal. Their clinical course varies widely, but on the whole, it may be said that their growth is rapid and dissemination early. This no doubt is due to the rich vascular and lymphatic supply and to the constant irritation and movement of the parts.

Surgical intervention has shown poorer results in successfully combating these conditions than in most any other field of surgery. The measure of success met with, depends entirely upon the location, extent of the growth and the stage at which the operation is performed as well as the thoroughness of the operation.

Frequently the primary lesion is operable but the lymph-nodes inoperable; and in many cases, operable as far as the extent of the disease is concerned, but the general condition of the patient is not sufficiently good to withstand the surgical shock. Many patients are affected with lung conditions or are suitable for intercurrent infections following the radical surgical procedure. In view of these considerations, one can see that surgery occupies a very limited field in the treatment of these diseases as a whole.

The references in the current literature to the use of radium in the treatment of malignant tumors of the nose and throat are relatively few. This no doubt is due to the comparative newness of the field. In making a survey of the literature it is found that in the majority of cases reported, individual typical cases seem to predominate. Therefore, it is very difficult to draw definite conclusions as to any one specific form of treatment for any certain type of malignancy. But in spite of this condition the men who are reporting cases all seem to point out that in almost every case treated with radium, some beneficial results have been obtained.

With the use of radium today in the special applicators, the treatment of malignant neoplasms of the nose and throat, has been greatly simplified and the end results of the treatment and the prognosis has been greatly improved.

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Dr. Rex Duncan of Los Angeles says, "The past five years have seen great advancement in radium-therapy equal to, if not greater than any other branch of medicine."

The late Dr. Russell H. Boggs, said "Radium's value in the treatment of mouth and throat malignanices has been recognized for some years, and with the adoption of the more recently perfected method of burying radium needles in the affected tissues, thus making it possible to administer a lethal or cancer-destroying dose with impunity to surrounding healthy tissue, its efficacy has been multiplied many fold, until it is now safe to award it first place in the treatment of all forms of malignant growths in mouth and throat."

Dr. C. Everett Field of New York makes the statement that, "The physician and dentist should be cognizant of the fact that every innocent-looking persistent ulcer on mucous membrane is probably malignant."

Malignancies of the tongue, tonsil and within the larynx have heretofore been classed as almost hopeless conditions, but now these conditions are combated with an increasing degree of success, by burying radium needles or emanation-spicules directly into the tissues involved and radiating about the regions where glandular metastases would be expected.

Many failures have been accredited to radium due to inexperience and lack of sufficient knowledge as to the proper dose to be given. Many treatments have been given where only partial doses were administered thus stimulating the cancer cells to more rapid growth rather than dealing the cells a death-blow or a lethal dose.

The results of radium treatment in malignancies depends upon whether a lethal dose is given and in giving a lethal dose the susceptibility of the malignant tissue to the radiation must be determined. In order to determine this, one must be thoroughly acquainted with the structural characteristics (histology) which determines the reaction to radiation.

Radium has demonstrated certain hitherto unknown cellular characteristics. It was observed that certain tissues were *resistant* to even large doses of radiation while others were quite *susceptible* and underwent resolution or retrogression with remarkably small units of beta or gamma rays. Dr. Sanford Withers of Denver points out six general structural characters which determine susceptibility to radiation. All are of a cellular nature:

"a. It has been shown that the more embryonal or undifferentiated the type of cell the greater is its radio-susceptibility; the con-

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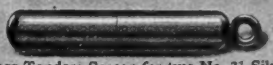

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Point of No. 520 Needle Introducer showing Needle in Position

verse is equally true that the more differentiated, highly specialized the type of cell the greater is its radio-resistance, in general.

"b. It is easily demonstrated that cells in the process of dividing, (mitosis), are from eight to fifteen times more vulnerable to radiation than when in the resting condition.

"c. It is equally true that cells containing large amounts of chromatin material are more easily killed than those containing little chromatin. In other words cells having hyperchromatic nuclei are in general much more radio-sensitive than similar cells having small amounts of chromatin in the nucleus.

"d. It is common knowledge that the endothelium of blood and lymph vessels is very radio-sensitive and that tumors having an abundance of thin-walled, delicate capillaries react much more quickly and favorably to radiation than corresponding tumors having a scanty blood supply.

"e. Tumors having small amounts of intercellular connective tissue react much more quickly and favorably to radiation than new growths having an abundant stroma.

"f. In general it may be said that cells which secrete crystalloid or crystallizable material are much more radio-sensitive than non-secreting cells having the same histological characteristics o' cells that secrete colloid or protein subtsances.

"It was the presence of this histological picture, wholly or in part, in tumors which responded quickly to radiation that lead certain authors to assert that radium was selective in its action for certain types of cells.

"On the other hand, tissues prove relatively insusceptible when the cells are differentiated, adult in structure and contain small amounts of chromatin in the nucleus; when they grow slowly and mitoses are few; when the blood supply is through well-formed adult vessels and when there is much intercellular material or stroma.

"Again the presence or absence of any one of these characteristics to a marked degree enables one to predict on *a priori* grounds that the growth *will* or *will not* retrogress favorably under radiation if properly applied. The radio-sensibility of cells does not in any way depend upon the anatomical location, but depends entirely upon the histological picture presented."

By the use of radium in the treatment of these conditions some hope of a cure can now be held out, and with the proper technic of application should lower the mortality in such cases appreciably.

No longer should cancer of the nose and throat be considered a hopeless condition, but with early diagnosis of such conditions and immediate treatment they should be considered hopefully.

It is impossible to lay down definite rules for the treatment of these conditions or to state definitely just what the dose should be in all cases, but each case must be considered and studied separately and the specific dose for that particular lesion determined, taking into account the susceptibility of the various lesions to irradiation.

INDICATIONS FOR RADIUM.

1. It might be said that radium is indicated in one form or another in all cases, either alone, pre-operative, post-operative or as a prophylactic against recurrences.

2. When surgery is impossible or impracticable.

3. Combined with surgery when complete removal is impossible.

4. Post-operative, after surgical removal of polyps to prevent recurrence.

5. In inoperable cases to relieve pain, hemorrhage, odor, discharge and sepsis.

Radium reacts favorably on the following types of tumors.

1. Favorable influence on round and spindle cell sarcomas and lympho-sarcomas.

2. Basal cell epitheliomas, yield to almost any method of application. These types can usually be clinically differentiated from other types.

3. Some squamous cell carcinomas are of high malignancy and are readily destroyed. The comparative malignancy may be determined by the rapidity of the tumor growth.

4. In leukoplakia, radium in general is the treatment of choice and this condition frequently changes into malignancy if not treated.

5. Hornifying verruca reacts to radium as if by magic.

6. Post-operative applications of radium prevent the recurrence of polyps.

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REPORT OF A DEATH FROM COCAIN POISONING.

Dr. Arthur M. Alden, St. Louis.

Mr. C. E. J., age 34, weight 178 pounds, referred for submucous resection of nasal septum.

History and Physical Examination: Patient is a very well developed white male who has no complaint other than that nasal breathing is difficult since he was hit on nose by a polo mallet four years before. Previous medical history negative except for ordinary diseases of childhood and one attack of malaria eight years ago.

Physical examination negative except for a relaxed inguinal ring on left side and several bad teeth. Blood pressure 125/80.

The usual preoperative measures were carried out except that no morphin or other drug was given. The nose was thoroughly douched with saline solution ten minutes before operation. In the operating room the patient was seated in the upright position in an operating chair. Preliminary to cocainization the mucosa of the septum and lateral wall of the nose was swabbed with one application of adrenalin, 1-1000 for shrinkage. Following this the septal mucosa was anesthetized by one thorough application of cocain, 10%, on a cotton-wound applicator, one application being made to each side. A few moments was allowed for completion of the anesthetic action of the cocain.

Just before the operation commenced the patient complained of a pain around his heart and almost immediately went into a clonic convulsion with cessation of respiration, the convulsion lasting about one minute. He was at once lifted from the chair and placed in a prone position on an operating table. His pulse was very rapid and feeble and pupils were widely dilated. Artificial respiration was at once started and camphorated oil given by hypo. The heart continued to beat for several minutes but all efforts to induce respiration were futile.

In order to be sure that no mistake had been made in the solutions, they were taken from the anesthesia table and sent to the laboratory for test. A quantitative examination showed the cocain solution to contain 8.65 per cent cocain. An autopsy, unfortunately, was not permitted.

3858 Westminster Place.

HEMOSTAT FOR TONSILLAR HEMORRHAGE.

Dr. Wm. Herbert, Brooklyn, N. Y.

Frequently in the removal of tonsils, irrespective of the method employed, there will be severed a small blood vessel which will spurt and will necessitate grasping with some kind of hemostat. The writer has been present on different occasions when, with the hemostats usually found in the operating room, considerable difficulty was experienced in grasping the exact point where the spurting occurred. In fact two or three clamps have been used on some occasions to grasp one vessel. Such a condition may arise from the rapidity of the bleeding, causing the

fossa to fill so quickly that the bleeding point cannot be seen clearly, or the ordinary hemostat with the sharp point is not quite the instrument to handle the situation.

The instrument illustrated here is suggested as perhaps useful in just such cases. The grasping surface is ⅛ inch wide, which gives the operator more of a chance in grasping the vessel which he cannot always see clearly, due to the bleeding or location. The curved tip is convenient, in that it is always in sight and is easier to guide. The length, 8¼ inches, is convenient for use in the throat.

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